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LAKE FREIGHT CONTRACTS.

The first move of the United States Steel Corporation in its dealings with shipping interests on the great lakes is indicative of a liberal policy. Immediately following his appointment as general manager of transportation matters, Mr. A. B. Wolvin entered into contracts with vessel owners of Cleveland, Chicago and Bay City for the movement of about 2,000,000 tons of ore during the coming season. It is understood that mines owned by the Steel Corporation are expected to produce something more than 13,000,000 tons of ore this year and that this is about 3,000,000 tons more than the capacity of their large fleet of vessels running up light for the full season. The freight contracts were made at 80 cents from the head of Lake Superior, 70 cents from Marquette, and 60 cents from Escanaba, and it is understood that the vessels are to be subject to assignment to any of the shipping ports at the rates named. These rates are looked upon as liberal rates, for the reason that the big corporation could undoubtedly have secured some vessel capacity on a basis of 70 cents a ton from the head of Lake Superior if disposed to do so, but it is also true, of course, that the policy of paying a better rate now and thus avoiding the possibility of a turn in the market, due to the uncertainties of labor troubles and other difficulties, may in the end prove wise. Other companies that will have ore to move have not as yet followed the lead of the corporation, some of them claiming that they will be able to get vessels at lower figures later on, and if not they will take chances on shipping the ore by "wild" charters throughout the season. Shippers of soft coal have done little in freights as yet. One or two blocks of coal for the head of Lake Superior have been covered by contract at 40 cents. Large quantities of coal could undoubtedly be covered at the same figure, but the shippers are disposed to hold for a lower rate. These transactions have, of course, broken up arrangements for a combination of individual vessel owners. When the contracts above referred to were announced, it was agreed at a meeting held in Cleveland, Wednesday, that nothing more would be done towards the formation of the proposed association.

Efforts were made on two or three occasions during the past week to settle difficulties with the marine engineers, but the situation is now just as it was in the beginning, except that it is said the engineers have decided to waive the claim of recognition as an organization and treat with the owners individually. However this may be, it is certain that officials of the Steel Corporation, as well as all the individual owners, are determined upon going ahead with the employment of engineers wherever they can get them, and fighting the matter out on the basis of last year's schedule of wages and no recognition of anyone excepting their employes.

STEEL CORPORATION OFFICIALS ON THE LAKES

Within a few hours after the appointment of A. B. Wolvin as general manager and Edwin S. Mills as assistant general manager of affairs of the United States Steel Corporation in the lake region plans were under way for placing under single management the 112 steel vessels of the new organization and for the appointment of a corps of assistants in offices at Duluth and Cleveland that will look after the movement of between 13,000,000 and 14,000,000 gross tons of iron ore during the season now opening. Contracts were also made at once with several vessel owners for transportation of the greater part of 3,000,000 tons of ore, which amount about represents the difference between the capacity of the Steel Corporation fleet and its output of ore. Appointments for different positions in the new organization include Capt. W. W. Smith as marine superintendent or principal assistant to Mr. Wolvin in charge of vessels' hulls, captains, operation of vessels, etc.; Joseph F. Hayes as chief engineer, with F. B. Smith and W. Fraser as assistants; Edward C. Collins as principal assistant to Mr. Mills in dispatch of vessels, Lake Erie docks, etc.; A. M. Harvey as assistant to Mr. Wolvin at Duluth in the loading of vessels at upper lake ports, and C. G. Lampman as chief steward. Capt. W. W. Smith was marine superintendent for Pickands, Mather & Co. and has a practical knowledge of vessel construction, wrecking operations and repairs. Joseph F. Hayes has been chief engineer of Wolvin vessels for several years past. Messrs. Smith and Fraser, who are to be engaged with Mr. Hayes, were chief engineers of the Carnegie and Bessemer ships, respectively. Mr. Collins has occupied with the Carnegie organization a position similar to that which he is to have with the big corporation and Mr. Harvey was principal assistant to Mr. H. Coulby in charge of vessels at the office of Pickands, Mather & Co. C. G. Lampman was in charge of the supply store maintained at Sault Ste. Marie by Pickands, Mather & Co.

RUMORED CONSOLIDATION OF COAST SHIP YARDS.

For some time past persistent rumors have been circulated regarding the proposed combination of several of the coast ship yards, though nothing of a definite character has ever been given out. During the present week these reports have crept into the newspapers and are identical with those which the Review has received of late from various sources. The story as published is that the proposed consolidation includes at present the Bath Iron Works, Bath, Me.; the Union Iron Works, San Francisco; the Newport News Ship Building & Dry Dock Co., Newport News, Va., and the Crescent Ship Yard, Elizabethport, N. J. Mr. Lewis Nixon of the Crescent Ship Yard is represented as being the one most active in bringing about the consolidation. It is understood that the arrangement is to be more of a pooling of interests rather than a trust. The purpose is to keep each yard busy upon the work which it is best fitted to perform. A change in a type of ship means a complete change in method of construction. A ship yard with several types on its ways is practically engaged in various forms of enterprise. Any combination of interest would, therefore, be directed to bringing about uniformity of construction in the individual yards.

LAKE SHIP YARD MATTERS.

With the close of the coming month the several yards of the American Ship Building Co. will have disposed of new vessels to such an extent that they could readily take on a dozen or more new orders. But the boom in ship building, as far as the lakes are concerned, is over with, and for the present little is expected in the way of new contracts. At the Lorain works two of the steamers building for F. H. Peavey and others of Duluth are still on the stocks, but one of these will be launched late in May (24th to 28th) and the other about the 15th of June. This will clear the stocks at Lorain unless new orders are secured in the meantime. The Globe yard, Cleveland, will launch the large car ferry for the Pere Marquette company about May 18, but will still have two 7,000-ton salt-water vessels under construction for Chas. E. & W. F. Peck of New York, and it is not expected that these will be finished until late in the fall. At West Bay City the two steel tow barges for D. R. Hanna and others have been completed for some time past, and one of the Gilchrist steamers building there will be launched on Thursday next. The second Gilchrist steamer will follow into the water in about two weeks. This will complete operations at West Bay City, as these two steamers are to get their machinery at Detroit. It is probable that Mr. Robert Wallace, who is in charge of the West Bay City yard, will later on go to Quebec to superintend the work of putting together there the two large steamers that are to go through the Canadian canals in halves from Cleveland to Quebec. The Chicago, Detroit and Buffalo yards are more fully supplied with work for the balance of the season. The four Counselman steamers for Chicago-Liverpool trade are practically disposed of at Chicago, but it will be late in the season before four big lake freighters still under way—two for C. W. Elphicke and others and two for F. H. Peavey—are entirely completed. The West Superior yard will also be employed on new work practically for the entire season, as the two D. R. Hanna steamers building there are not yet fully ready for service, and work is only starting on the large freight steamer for the Milwaukee Tug Boat Line. With three very large passenger steamers to build and two 5,000-ton freighters for Frank E. Kirby and others, the Detroit works will have employment late into the spring of next year, even though no more new orders are booked. At Buffalo facilities permit of the building of only one steamer, and the yard at that point will therefore be engaged during the greater part of the summer on the package freight steamer just started for the Western Transit Co. The freight steamer Mauch-Chunk for the Lehigh Valley Transportation Co., was launched at the Buffalo yard Wednesday. She is 404 ft. long, 50 ft. beam and 30 ft. depth of hold. She has quadruple expansion engines and three boilers capable of carrying 210 lbs of steam. She will carry 6,000 tons of freight. The keel was laid late in December and the new boat will be ready for business about June 1.

The announcement from Toledo that the Craig Ship Building Co. is to build four instead of two ocean-going steamers for the United Fruit Co. of Boston gives assurance of active operations at the Toledo works until well into next year, as the Craigs already have five other steel vessels under way. Two or three of the latter, however, are now almost as well as completed. The two new United Fruit Co. vessels are to be practically duplicates of two ordered some time ago. They will cost nearly $200,000 each, and in addition to large freight capacity will have accommodations for sixty cabin and 100 steerage passengers.

James Davidson of West Bay City confirms the announcement made in these columns some time ago regarding his plans for the establishment of a ship yard at Erie for the construction and repair of steel vessels. He says the people of Erie have offered him a free site, a liberal cash bonus and low taxes for ten years. The plant will include a dry dock, foundry and machine and boiler shops.

A wooden tug to be used at Manistique, Mich., by the Chicago Lumber Co., was launched at the ship yard of Burger & Burger, Manitowoc, Wis., Saturday. The tug will cost about $14,000.

INTERNATIONAL STEEL, IRON & PIPE CO.

During the past week F. H. Clergue of Sault Ste. Marie, Ont., and A. R. Harvey of the Commercial Development Corporation of Liverpool, London and New York, have formed the International Steel, Iron & Pipe Co., with a capital of $50,000,000, to establish two large steel mills, one on each side of the St. Mary's river at the American and Canadian saults. It is said that the mills will have a capacity of 600,000 tons annually and will employ 10,000 men. Interests controlling the Lake Superior Power Co. and other Clergue enterprises are connected with the new project. In discussing the enterprise Mr. Harvey said:

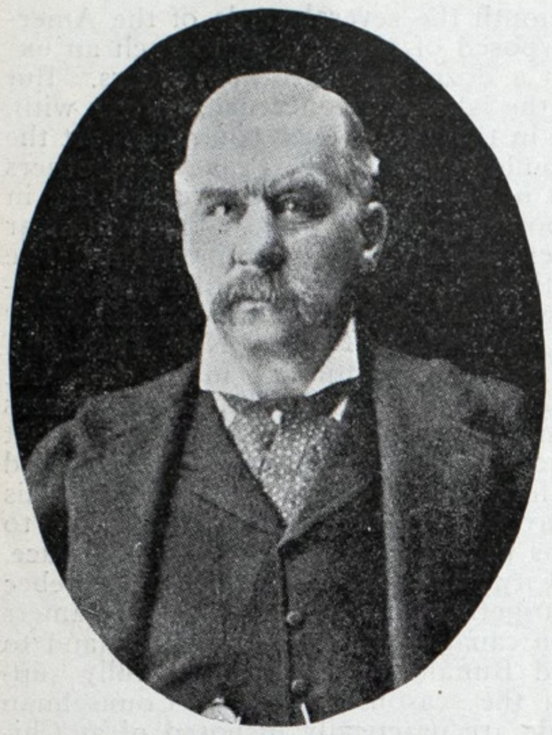
"Our product will be steel ingots, blooms, billets, rails, plates, structural iron, pipes and tubes. We have already made arrangements for lands for the homes of the workingmen in addition to the 1,000 acres that we shall require for our mills. I have made contracts with Mr. Clergue running for thirty years by which we will get iron ore from the Michipicoten range and nickel from the mines of the Sudbury range, and I have also made a thirty-year contract with the Lake Superior Power Co. for shipping our products and our supplies."

The Duluth, Mesabi & Northern Railway has stopped all work upon its extension to the Stevens mine of the Mesabi range. This mine lies much nearer the terminus of the Duluth & Iron Range Railway, but when the property was leased to the Carnegie interests by John D. Rockefeller it was stipulated that the ore should be transported over the Duluth, Mesabi & Northern Railway. A contract aggregating $300,000 was entered into for the spur and about $150,000 had been expended when the Steel Corporation took over the Rockefeller interests. The railway contractors were requested to name a figure at which they would relinquish their contract. They did so and it was accepted. A short spur will now be built from the Duluth & Iron Range Railroad to the mine.

EXECUTIVES OF THE STEEL CORPORATION.

LITTLE SKETCHES OF MEN WHO ARE TO MANAGE THE AFFAIRS OF AMERICA'S GREATEST INDUSTRIAL ORGANIZATION - A WONDERFUL INSTITUTION.

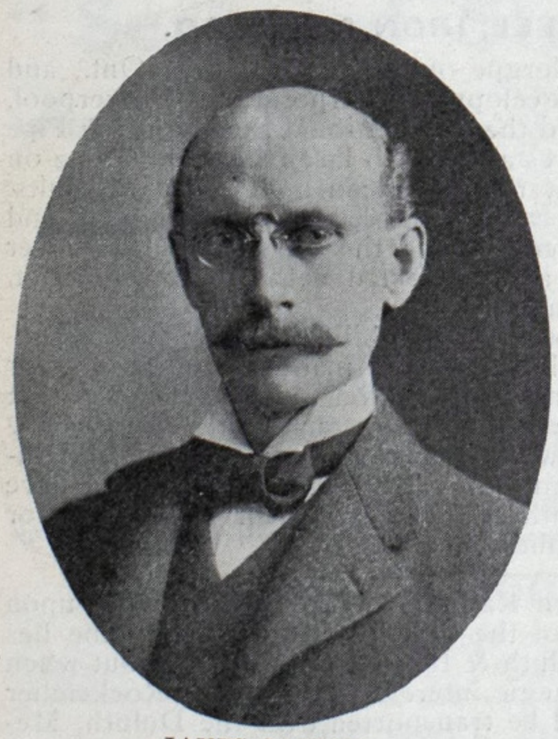
A few days ago a report reached New York that the Teutonic with J. Pierpont Morgan on board was laboring in heavy seas, but no concern was expressed for the safety of the passengers, one broker remarking that if J. Pierpont Morgan could float the Steel Corporation he could float the Teutonic too. The story is pat since it illustrates the confidence in which Mr. Morgan is held. There seems to be no limit to this marvelous man's capacity. Even while the details of the United States Steel Corporation were forming, there were other deals on of great magnitude. The public heard little or nothing of them until they were completed. It was the formation of the Steel Corporation, however, which brought Mr. Morgan prominently before the public, because nothing quite so vast has ever before been attempted and because its formation meant the retirement to private life of the greatest steel maker of all time—Andrew Carnegie. Mr. Morgan was, of course, for many years before a world famous man, but he has not always held the center of the stage. He has been active as a financier for over forty years. It might truthfully be said that during all that time he has been the foremost financier of the country. He started in life with a great fortune, which, needless to say, has doubled and quadrupled since. He has always been a constructionist, a builder, not a destroyer. He is a business man who detests a speculator and who believes in hard work. Personally he is comprehensive—fond of paintings, books, dogs and horses—a complete sort of man with many sides, a man who, having worked hard in one direction, can seek recreation by working hard in another. As indicating the confidence that New York capitalists, associates of Mr. Morgan, have in the man, it is said that in large undertakings during several years past he has repeatedly been entrusted with immense sums of money to be used for purposes that were not made known to the investors until after the preliminaries of organization, purchase of property and distribution of stock were all disposed of; and that on such occasions there were always a great many people disappointed because they had not been given opportunity to turn over absolute control of their money for such investments.



J. PIERPONT MORGAN.

CHARLES M. SCHWAB.

Next to J. Pierpont Morgan comes Charles M. Schwab, the president of the great corporation. Unlike Morgan, Schwab is one of the distinctively American products—the man who starts in life without a dollar. In 1880 Charles Schwab was a grocery boy in Braddock, Pa., with the usual pay that a boy of eighteen years would get for that service. Capt. Jones of the Edgar Thomson Steel Works happened to visit the store one day and Schwab asked him for a job. He got it driving stakes for a surveying party. In a little while he was one of the surveyors and some one else was driving stakes for him. Then he went into the draughting room where he remained for three years. He filled various places, studying hard meanwhile in a little laboratory which he had rigged up at home until 1889 when Capt. Jones was killed in an explosion at the Edgar Thomson works and Schwab succeeded him as superintendent. In 1892 he was managing both the Homestead and Thomson works and speedily became a partner. In 1897 he was made the president of the Carnegie Co. and in 1901 of the United States Steel Corporation. Schwab is probably the one man in the country who combines great mechanical ability with financial and executive management of the highest order. He is regarded as a mechanical genius with the most daring of minds. Some of his methods have been revolutionary but they have all succeeded. The fact that the Carnegie minority placed all their interests in his hands when the merger into the Steel Corporation was on speaks volumes for his financial ability. He is thirty-nine years old. a kindly, courteous man, but with the heart of a lion and the energy of a thunderbolt. There are other men in the country, doubtless, who combine the widely scattered attributes that are necessary for the administration of this giant corporation but they have not been discovered as yet.



JAMES GAYLEY.

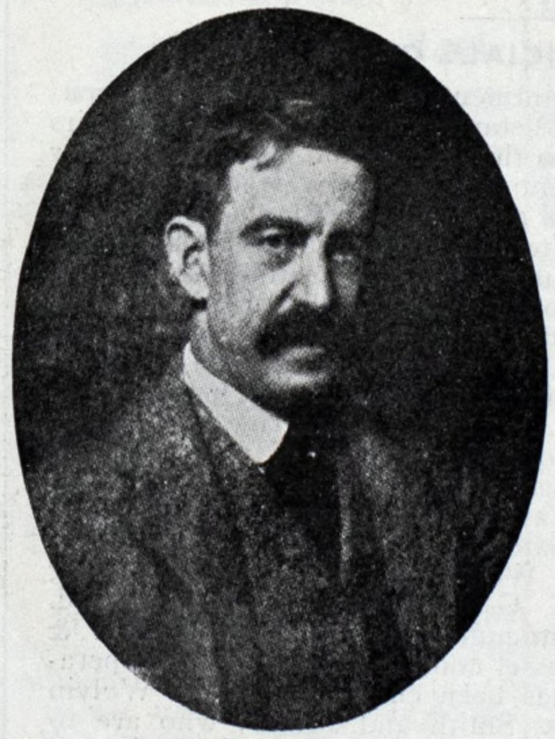
It is understood that when Mr. Schwab accepted the presidency of the great corporation he should have the undisputed right to name at least three of his assistants. It was therefore natural that he should turn to the Carnegie organization for the first vice-president. In selecting Mr. James Gayley he selected a man who had been closely associated with him for several years. Mr. Gayley is a product of the Carnegie company, a development of its later years. He has occupied several important positions but his most important was his latest office, since it covered so many important departments. He was in charge of the ore and blast furnaces of the company, to which was added supervision of iron mining, docks and vessel interests. His duties in the Steel Corporation as first vice-president are broadly these—in charge of the raw material and its transportation from the mines to the furnaces. He is vastly competent for the office. No better man could have been selected.

ELBERT H. GARY.

Elbert H. Gary, chairman of the executive committee, has been associated with the iron industries as counsel for a great many years. His home is at Wheaton, Ill., where he was born in 1846. He was admitted to the bar in 1867 and served as mayor of Wheaton for two terms. While pursuing the practice of law in Chicago he became associated with the Illinois Steel Co. and later became its president. When the Illinois Steel Co. was merged into the Federal Steel Co. he became the president of the latter organization.

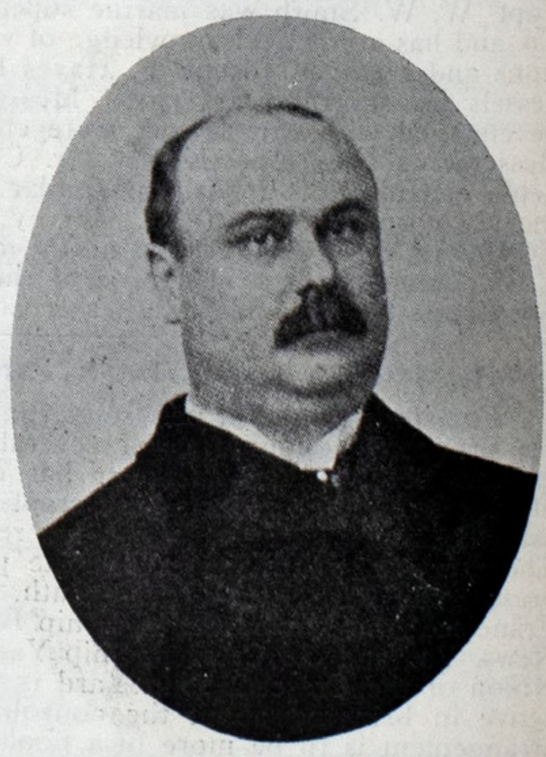
Arthur F. Luke, treasurer of the Steel Corporation, was a messenger boy in a bank in his early days. He maintained various bank connections until 1890, having served for ten years as the cashier of the National Bank of North America of Boston, Mass. In 1890 he was elected treasurer of the National Tube Works. When the National Tube Co. (consolidation) was formed in 1899, Mr. Luke was selected as the treasurer.

Daniel G. Reid, president of the American Tin Plate Co., has also been associated with banks during the greater part of his life. He was connected with the Second National bank of Richmond, Ind., for twenty-five years. In 1891 he associated himself with the American Tin Plate Co. of Ellwood, Ind., one of the earliest of the companies to engage in the manufacture of tin plate under the McKinley bill. In 1898 when the tin plate mills were consolidated under the title of the American Tin Plate Co. Mr. Reid became president of the consolidation. He is also a director in the other Moore companies—the National Steel, American Sheet Steel and American Steel Hoop.



ARTHUR F. LUKE.

Mr. William Edenborn has the distinction of having drawn the first piece of wire ever produced west of Cincinnati. This was at the St. Louis Wire Mills in 1869. Mr. Edenborn became connected with the firm of Ludlow, Saylor & Co. in 1871 and remained with them six years, when he associated himself with O. P. Saylor in the St. Louis Wire Mill Co. He also acquired an interest in the Western Union Wire Co. In 1882 Mr. Edenborn sold a one-half interest in the St. Louis Wire Mill Co. to John W. Gates and A. Clifford, owners of the Southern Wire Co. At the same time he acquired a half interest in the Southern Wire Co. Shortly thereafter the Western Union Wire Co. was also absorbed. A rod mill was built at Rankin, Pa., and called the Braddock Wire Co. The Rankin and St. Louis plants were united with several others under the title of the Consolidated Steel & Wire Co. Mr. Edenborn was its president up to 1898. When the American Steel & Wire Co. of New Jersey



DANIEL G. REID.

was formed he became first vice-president and a member of the executive committee. Mr. Edenborn is largely interested in other enterprises.

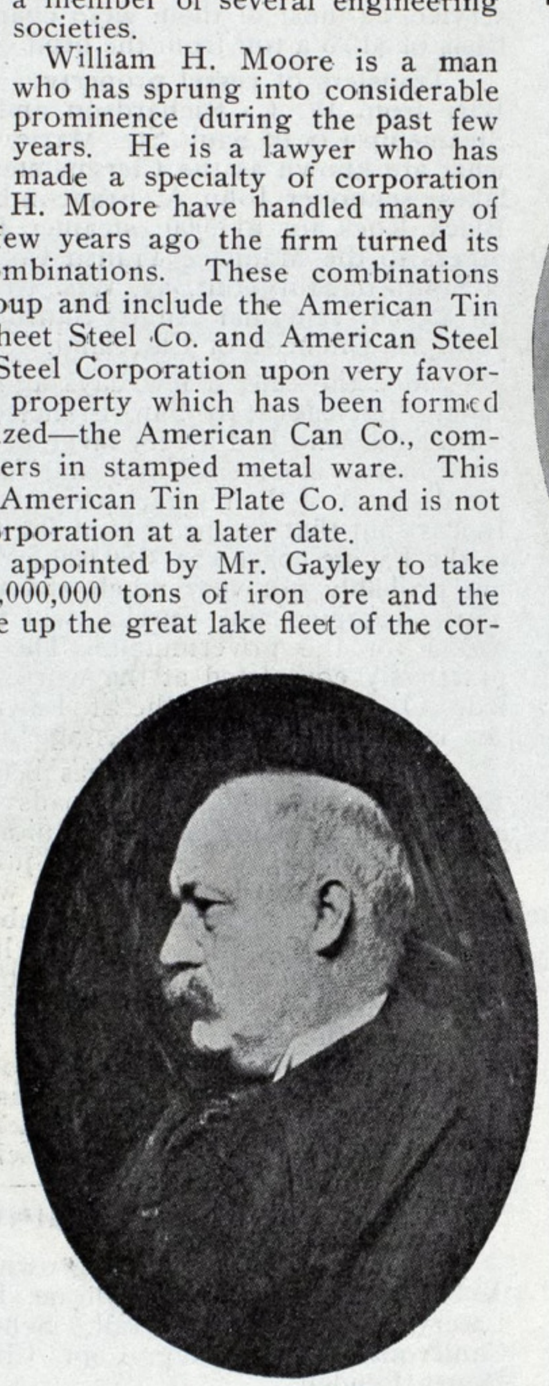
E. C. Converse has had a practical business experience since his boyhood. His father, the late James C. Converse, was the first president of the National Tube Works Co. Young Converse entered the service of the company in 1872 at McKeesport, Pa. He went through each department successively, and in 1889 was appointed general manager. Meanwhile he had organized the Republic Iron Works and Monongahela Furnace Co., which were merged into the National Tube Works Co. in 1892. Later Mr. Converse attempted to consolidate all the wrought iron and steel tube works in the United States but without success. He later succeeded in merging about twenty pipe concerns under the title of the National Tube Co. Mr. Converse was elected president.

WILLIAM EDENBORN.

Percival Roberts, Jr., was born in 1857. He entered the Pencoyd Iron Works as clerk in 1876 When the A. & P. Roberts Co. was formed he became its vice-president and later its president. When the American Bridge Co. was organized he became its president. He has various other interests, being a railroad director and bank director. He has received a thorough training in metallurgy and chemistry and is a member of several engineering societies.

William H. Moore is a man who has sprung into considerable prominence during the past few years. He is a lawyer who has made a specialty of corporation law, and the firm of William H. & J. H. Moore have handled many of the important corporation cases. A few years ago the firm turned its attention to organizing industrial combinations. These combinations have become known as the Moore group and include the American Tin Plate, National Steel Co., American Sheet Steel Co. and American Steel Hoop Co. All these have entered the Steel Corporation upon very favorable terms. There is another Moore property which has been formed since the Steel Corporation was organized—the American Can Co., combining the tin can factories and workers in stamped metal ware. This company is closely associated with the American Tin Plate Co. and is not unlikely to be admitted to the Steel Corporation at a later date.

Mr. A. B. Wolvin, who has been appointed by Mr. Gayley to take charge of the movement of about 14,000,000 tons of iron ore and the management of 112 vessels, which make up the great lake fleet of the corporation, has had the usually picturesque career of the American self-made man. In fact, however, it finds its prototype in so many instances that its picturesqueness becomes commonplace. He started in life as a cabin boy on the Dean Richmond, a propeller, of which his father was captain.



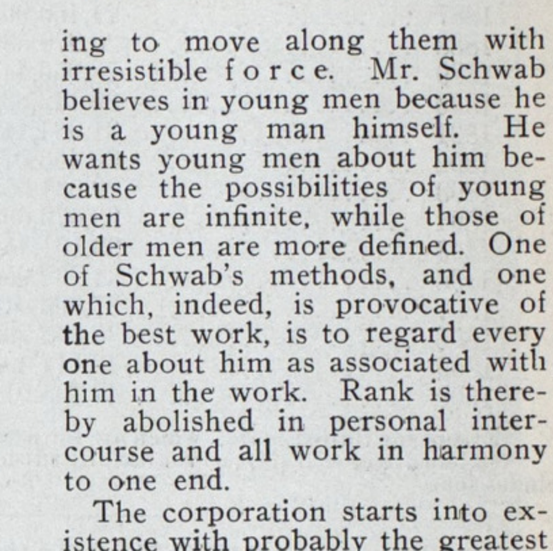
E. C. CONVERSE.

first boat was the steamer Anne Smith, which he sailed in 1879, and he also commanded the Swain, the Raleigh and the City of Rome. He left the lakes in 1882 but returned in 1889 as vessel agent with the late Capt. F. N. LaSalle of Duluth. After that his career of advancement was rapid. He became manager of what were known as the American Steel & Wire vessels, including four steel freighters built about three years ago but still the largest on the lakes. He introduced various innovations in the construction of lake freighters and showed himself to be thorough master of a ship from its building to its operation. He is also president of the Superior Ship Building Co., local manager at Duluth and Superior for the Great Lakes Towing Co., agent of the Western Transit Co., and is associated with J. J. Hill of Great Northern Railway fame in the construction of the two mammoth steamships for Pacific service now building at New London, Conn. Mr. Wolvin will have his headquarters at Duluth and will define the policy to be pursued in the management of the great fleet.

A. B. WOLVIN.

Mr. Edwin S. Mills, upon whom as assistant general manager will fall a large part of the work of actual management of the lake fleet, and distribution of ore at Lake Erie ports, will have his headquarters in Cleveland, where the greater part of the force of employes connected with lake interests will be located. Mr. Mills is a very young man. There is probably not in all the United States a man of his age entrusted with anything like the important responsibilities that he takes up with the opening of lake navigation. He was sales agent for the Carnegie Co. in the Cleveland district when that company, only three or four years ago, began buying iron mining properties in the Lake Superior region on an immense scale. He showed himself capable of caring for the important work of moving an immense volume of iron ore and managing later for the Carnegie interests the affairs of the Pittsburg Steamship Co., which built and purchased a fleet of some thirteen or fourteen steel vessels.

The one thing noticeable in this giant organization is the young blood in it—that is young blood in its working force—Schwab, Gayley, Walker, Wolvin, Mills. There is method in it. Young blood means enthusiasm and energy. It means to dare. It does not mean as might be implied a lack of conservatism. The corporation has already given evidence of conservative management. It is going to move along carefully considered lines with well-matured plans, but it is going to move along them with irresistible force. Mr. Schwab believes in young men because he is a young man himself. He wants young men about him because the possibilities of young men are infinite, while those of older men are more defined. One of Schwab's methods, and one which, indeed, is provocative of the best work, is to regard every one about him as associated with him in the work. Rank is thereby abolished in personal intercourse and all work in harmony to one end.



PERCIVAL ROBERTS, JR.

WILLIAM H. MOORE.

The corporation starts into existence with probably the greatest impetus ever given to any corporation. All of its constituent companies have been unusually successful. One of them alone, the Carnegie Co., made enough money last year, it is said, to pay the interest on the bonds of the big corporation, as well as the 7 per cent. dividend on preferred stock, leaving the earnings of the other companies to provide for improvements, depreciation and possibly some sharing of profits among common stockholders.

The corporation has tangible assets of the most valuable character. One hears now and again of valuable ore deposits in various parts of the world. At present much has been said of a deposit of lean ore, containing 80,000,000 tons, in Norway, which Edison is to concentrate by some electrical process into 40,000,000 tons of good Bessemer ore. This great corporation has eighty times 80.000,000 tons of ore in the Lake Superior region, which requires merely to be shoveled upon the cars. It is a wonderful asset. It has two railways leading to these deposits, docks for handling it and a magnificent fleet of steamers. Its great advantage in the manufacture of steel lies in the abundance of its raw material and the cheapness with which it can be transported to the furnaces. This one advantage is almost unconquerable. It has the men, too, who have brought the ton cost of things down to the minimum.

EDWIN S. MILLS.

The fleet of steamers which the corporation possesses are capable of moving in a full season about 10,000,000 tons of ore. The corporation has need, therefore, for the present of possibly not more than 3,000,000 tons of outside vessel capacity. This means, therefore, that its ore production in the coming season will be between 13,000,000 and 14,000,000 gross tons, nearly all of which will be consumed in its own works. The big organization has, of course, taken over from the mining companies some contracts that will force it to furnish ore to its competitors for some time to come, but the amounts involved in such obligations are not very large as compared with the aggregate output. These contracts are mostly of the kind made by the Rockefeller interests, involving the delivery of ore over a term of years at prices considerably lower than those that have prevailed during the past two years.

PRODUCTION AND EXPORT OF COAL.

The announcement of a prospective export tax of 1s. per ton on English coal adds interest to the fact that American coal is making rapid headway in invading the markets of the world. The figures of the treasury bureau of statistics indicate that the coal exports of the fiscal year, which ends June 30, will amount to about 8,000,000 tons, as against less than 2,000,000 tons in 1890, 3,772,192 tons in 1895, and 7,188,648 tons in 1900. This export figure is as yet small compared with that of the United Kingdom, or compared with our coal area, which is many times as great as that of any other of the great coal exporting nations, but the growth in our own case has been much more rapid than that of any other country. The United Kingdom, for instance, exported 30,142,839 tons in 1890 and 46,108,011 tons in 1900, the relative growth being much greater in the case of the United States than in the case of the United Kingdom. Germany is the second great coal exporting country of the world, and her exports only increased from 9,145,000 metric tons in 1890 to 15,276,000 tons in 1900. The United States now ranks third in the matter of coal exportations, while Belgium ranks fourth with a total exportation of 6,114,000 tons in 1890 and 6,931,575 tons in 1900. Thus the relative growth of coal exports from the United States by far exceeds that of any other nation, while it now holds third place in actual exportation. In production the United States has within the last two years taken first rank, her total coal production in 1899, the latest available year, being 226,553,564 tons, against 220,094,781 tons by the United Kingdom; while in 1890 the production of the United Kingdom was 181,614,288 tons, and that of the United States 140,882,729 tons.

The following table shows the exports of coal from the United Kingdom, Germany and the United States, in each year from 1885 to 1900, the figures for Germany being in metric tons of 2,208 lbs., and those for the United Kingdom and the United States in long tons of 2,240 lbs.:

	COAL EXPORTS FROM		
*Calendar Year.	**United Kingdom, tons.	Germany, tons.	United States, tons.
1885	23,770,957	9,956,000	1,272,000
1886	23,283,389	8,655,000	1,224,000
1887	24,460,967	8,782,000	1,324,000
1888	26,970,536	9,460,000	1,725,000
1889	28,956,445	8,847,000	1,785,000
1890	30,142,839	9,145,000	1,933,000
1891	31,084,116	9,536,000	2,400,000
1892	30,453,973	8,971,000	2,509,000
1893	29,031,955	9,677,000	2,847,000
1894	33,073,698	9,739,000	3,616,000
1895	33,101,452	10,361,000	3,871,000
1896	34,262,056	11,599,000	3,775,000
1897	37,096,918	12,390,000	3,820,000
1898	36,562,796	13,989,000	4,221,000
1899	43,111 404	13,943,000	5,267,000
1900	46,108,011	15,276,000	7,188,000

*Except for United States, which are for fiscal years.
**Exclusive of coal shipped for use of British steamers engaged in the foreign trade. Includes coke.

DULUTH GRAIN SITUATION.

G. A. Tomlinson, vessel agent of Duluth, furnishes the following statement of grain in store at the head of the lakes April 22, compared with the same date a year ago:

	1901.	1900.
Wheat	10,107,383	19,047,680
Barley	74,203	254,924
Flax	346,520	327,684
Oats	1,325,950	364,208
Rye	410,421	441,377
Corn	5,189,952	1,472,253
Total	17,454,429	21,908,126

Mr. Tomlinson says there is some demand for tonnage, but no ships to be had on account of the several conditions that have delayed the opening of navigation. Ice has disappeared to such an extent that it is now possible to reach any dock or elevator in Duluth-Superior harbor.

NEW STEAMSHIP CO. AT SEATTLE.

Announcement is made of the organization by eastern capitalists of an important new maritime corporation which will operate from Seattle with a fleet of several large steamships and a number of sailing vessels. The company will be known as the Globe Transportation Co. and its capital will be $1,500,000. J. W. Clise of the Seattle Chamber of Commerce will have charge of the general management and control of the new line. It is understood that three steamers have already been purchased and that the company will build its own sailing vessels.

"There is no field before the American investor today," said Mr. Clise, "which offers greater money-making opportunities than the carrying trade, and particularly the carrying trade of the United States. Seventy years ago we were carrying 91 per cent. of our own commerce. Today we are carrying only 8 per cent., but we are expanding again, and those most familiar with the subject appreciate the need of doing our own commerce. The interests of eastern Washington have been begging for more shipping facilities ever since the state began to develop. The increased facilities are on the way, and all tending to the rapid and certain development of Seattle as an important seaport."

Lyman C. Smith manufacturer of typewriters, of Syracuse, N. Y., who has invested largely in Seattle in the last few years, is one of the leading stockholders in the new company.

At the annual meeting of the Boston Towboat Co. last week the old board of directors was re-elected. It was voted to authorize the directors to issue $250,000 of additional capital stock at their discretion. The report of the directors states that net earnings amounted to $177,662, from which the regular dividend of 6 per cent. and an extra one of 5 per cent. has been paid.

AROUND THE GREAT LAKES.

New York state canals will be opened to navigation, by order of the state superintendent of public works, at noon, May 4.

J. H. Gibbs of Chicago, chief engineer of the steamer Hesper, died in a hospital at Manitowoc, Wis., a few days ago of pneumonia.

Capt. John Robertson, who was in command of some of the finest of lake vessels back in the early fifties and who has of late sailed passenger steamers on the Detroit and St. Clair rivers, died at his home in Detroit Tuesday. He was seventy-three years of age.

Vessel property of the late W. H. Wolf of Milwaukee will be owned by the West Division Steamship Co., recently organized by the heirs. The capital is $225,000. The company will be represented by David Vance & Co. The steamers Wolf and Pabst and the schooner Armenia, comprising the fleet, will have their registry changed from Chicago to Milwaukee.

Vessels of the Lake Michigan & Lake Superior Transportation Co., Chicago, are all well prepared for another season's work. The steamer Gould, first boat of the line to be fitted out, was to leave Chicago Thursday for Duluth and intermediate points, to be followed by the other three boats of the line at intervals of three or four days. General improvements were made in the steamers Peerless and City of Traverse during the winter, including a first-class electric lighting plant on each vessel.

Points of interest regarding the opening of navigation in 1900: The first vessel through the Straits of Mackinaw was the Jesse Spalding, down-bound, April 18. The entire Chicago grain fleet was bound down Lake Michigan April 20 to April 22. Several vessels took on cargoes of iron ore at Escanaba April 20. The steamer M. A. Hanna was the first vessel to pass the St. Mary's Falls canal—April 22—up bound. There was no delay after this beginning was made. All the ships were ready for service, as most of them were chartered for ore for the full season on a basis of $1.25 a ton from the head of Lake Superior.

Transfers of vessel property: Schooners John J. Barlum and H. A. Barr from W. C. Richardson and others of Cleveland to the Algoma Steamship Co. of Sault Ste. Marie, Ont., to be used as towing vessels for what are known as the Clergue steamers, brought from the Clyde to the lakes; schooner John A. Francomb to Nelson B. Graves Lumber Co. of Black Rock for $14,000; steamer Hennepin from W. E. Fitzgerald and others to the Manistee Transit Co.; tug Sydney T. Smith from Leatham & Smith of Sturgeon Bay, Wis., to Termensen & Jensen of Sturgeon Bay for $8,000; schooner Angus Smith from John M. Thomas of Duluth to John D. Gilchrist of Cleveland.

Since the sale, a few days ago, of three steel steamers of Canadian canal dimensions to San Francisco parties, the Messrs. Hawgood of Cleveland, who had a very large fleet only a short time ago, have left but three boats—steamers Curry and Iosco and schooner Olive Jeanette. But the disposal of their vessel property has not been at a loss by any means. It was said that the price paid for the three steel steamers that are to go to the Pacific coast was $180,000 each. This is higher than the real figure, but probably not very much above it. The two ships that are at New York, Tampico and Eureka, will take Pocahontas coal around to California for the government. The third vessel, Meteor, which is now practically completed at the works of the Craig Ship Building Co., Toledo, O., will go down the St. Lawrence canals to the Atlantic as soon as she is assured of a clear passage.

Official announcement has been made in a joint circular from the Erie and Lehigh Valley railroads of the appointment of T. T. Morford as general manager of the Union Steamboat Co. and Lehigh Valley Transportation Co., with headquarters in Buffalo. For twenty-eight years Mr. Morford has been the western agent of the Union Steamboat Co. in Chicago. He began steamboating when a boy as clerk on one of the steamers of the line, working his way upward gradually until he has become its head. The combined tonnage of vessels now under Mr. Morford's control is 42,821 tons. There are eight steamers in the Union line and six in the Lehigh Valley. J. M. Davis, recently appointed superintendent of the Union line, will continue in the same position with the consolidation. The Lehigh line has been managed for two years through the office of Division Superintendent Van Allen. Mr. Morford will care for the lake freight of the Erie, Lehigh Valley and Lackawanna railroad.

MASTERS AND ENGINEERS OF LAKE VESSELS.

McLean, A. C., managing owner, East Saginaw, Mich.: Steamers—A. A. Turner, Capt. John Stone, Engineer Jas. Wellman; Maine, Capt. Latery, Engineer John Hall. Schooners—B. B. Buckhout, Capt. Alex. Cameron; H. W. Haag, Capt. Chas. Van Norman; D. Pendell, Capt. Henry Pendell.

Lake Michigan & Lake Superior Trans. Co., Chicago: Steamers—Peerless, Capt. H. C. Page, Engineer J. R. Bennett; City of Traverse, Capt. N. McCormick, Engineer E. Meeh; Jay Gould, Capt. Charles Wilson, Engineer H. Chalk; Osceola, Capt. Joseph White, Engineer James Oag.

Boland, John J., Buffalo: Steamers—W. L. Wetmore, Capt. D. O. Hagan, Engineer W. Nibbs; Grand City, Capt. John O. Hagan, Engineer J. Butler. Schooners—Brunette, Capt. Hugh O. Hagan; Jas. C. King, Capt. Alfred Nerburn; Jno. Magee, Capt. Wm. Kelley.

Comstock, A. W., Alpena, Mich.: Steamer—Simon Langell, Capt. J. A. Stewart, Engineer R. Cameron. Schooners—W. K. Moore, Capt. Bert Warwick; Interlaken, Capt. Chas. Adams; Arenac, Capt. Wm. F. Hormig; Theo. Voges, Capt. A. Kunna.

Chamberlain, S. R., Chicago: Steamers—H. L. Worthington, Capt. Wm. McKay, Engineer J. Murdock. Schooners—J. B. Wilbor, Capt. M. C. Clark; A. T. Bliss, Wm. Chamberlain; D. R. Martin, Capt. Wm. Kaufman.

The steamship Saale, the old German Lloyd liner, will soon fly the stars and stripes and see service as an American tramp. Her large engines with 44 in. high and 108 in. low pressure cylinders, and 72 in. stroke, are to be removed and new modern triple expansion engines built of 2,500 I.H.P., which will give her a speed loaded of about 11 knots. Some experts say that the Saale is too fine a ship to make a success as a purely cargo vessel.

RIVER AND HARBOR IMPROVEMENTS AT TOLEDO.

Toledo, O., April 24.—A short talk with United Stares Assistant Engineer Wm. T. Blunt brings out considerable information of value to vessel men regarding the straight channel and other improvements. The work of widening and deepening the straight channel through Maumee bay, under continuous contract with the Lydon & Drews Co., was resumed April 23, three dredges being placed at work about half way between the mouth of the river and the crib range in the bay. It is intended to first accomplish the deepening of the present channel throughout before any widening is attempted. During the season of 1900 the work of deepening the channel under this contract for its width of 200 ft. progressed from the mouth of the river outward about two miles. Over this area there is now a depth of 21 to 23 ft. at mean level for its entire width of 200 ft. From the outer end of this work outward to the cribs the present depths are probably not less than 18 ft. along the axis of the channel, shoaling to about 16 ft. on its sides, its width being 200 ft. From the cribs outward to the lake, it is believed the depths are greater than 18 ft. for the entire width of 300 ft.

For some months to come three dredges will be working on the 200-ft. channel inside the cribs, and as they are large machines using large and heavy scows, it will be necessary for passing boats to use considerable care in running this part of the channel. While the dredges are instructed to give all possible leeway to passing boats, it is also necessary for the boats themselves to meet the conditions with some patience and consideration, so long as the work is being done on this narrow reach. It is hoped that by the end of the season the deepening to 21 ft. or more will have progressed some distance outside the cribs.

The widening and deepening of the channel through Maumee river up to Schenck's coal wharf is being done by the United States dredge plant. It will be several years before this work is entirely completed, but the deepening is being done in such order as seems to give the largest advantage to the general interests of navigation. At present the dredge plant is engaged at Fairport harbor removing the bar which has formed across its entrance, but upon completing this work it is expected that the work in Toledo will be resumed.

Rules issued by the secretary of war to control the navigation of the Toledo straight channel remain in force, the speed limit being 10 miles per hour and the tow line limit 200 ft. in length.

Many snags were found drifting or fast in the channels after the unusual high water accompanying the breaking up of the ice this spring. Most of these snags have already been removed so that the channel is practically clear. An improvement of the shore line of considerable importance has been accomplished by private parties between Adams and Jefferson streets, where an area of about 150,000 sq. ft. has been reclaimed by filling from the river behind bulkheads, thus bringing the wharves out to the established harbor line. At this wharf will be handled the business of the Cleveland & Toledo boats, the Star line boats from Detroit, the freight boats of the Wabash line, etc.

On the east side of the river a large pond belonging to the Toledo & Ohio Central Railway Co., between its tracks and those of the Pennsylvania Railway Company, is being filled by material taken from the bed of the river. This pond is about 1,700 ft. by 350 ft. in area and from 4 to 10 ft. deep. The pond is a part of the original river cut off by the extension of the railway filling, many years ago.

Work is progressing rapidly upon the new Lake Shore & Michigan Southern Railway bridge which is being built to replace the old one, and will be located about 60 ft. below it. Abutments have been built and dredging is now in progress for the foundations of the piers. The authority issued by the secretary of war for this work requires the railway company to keep at least one side of the draw free for navigation at all times.

The crib which is being built by the light-house establishment to carry the new light-house and fog signal at the outer entrance to the straight channel is rapidly nearing completion, and its launching is expected to take place within two or three weeks. It will be placed about one mile outside the present location of the can buoys, in about 21 ft. of water, and about 400 ft. northerly from the axis of the channel.

LAUNCH OF SHAMROCK II.

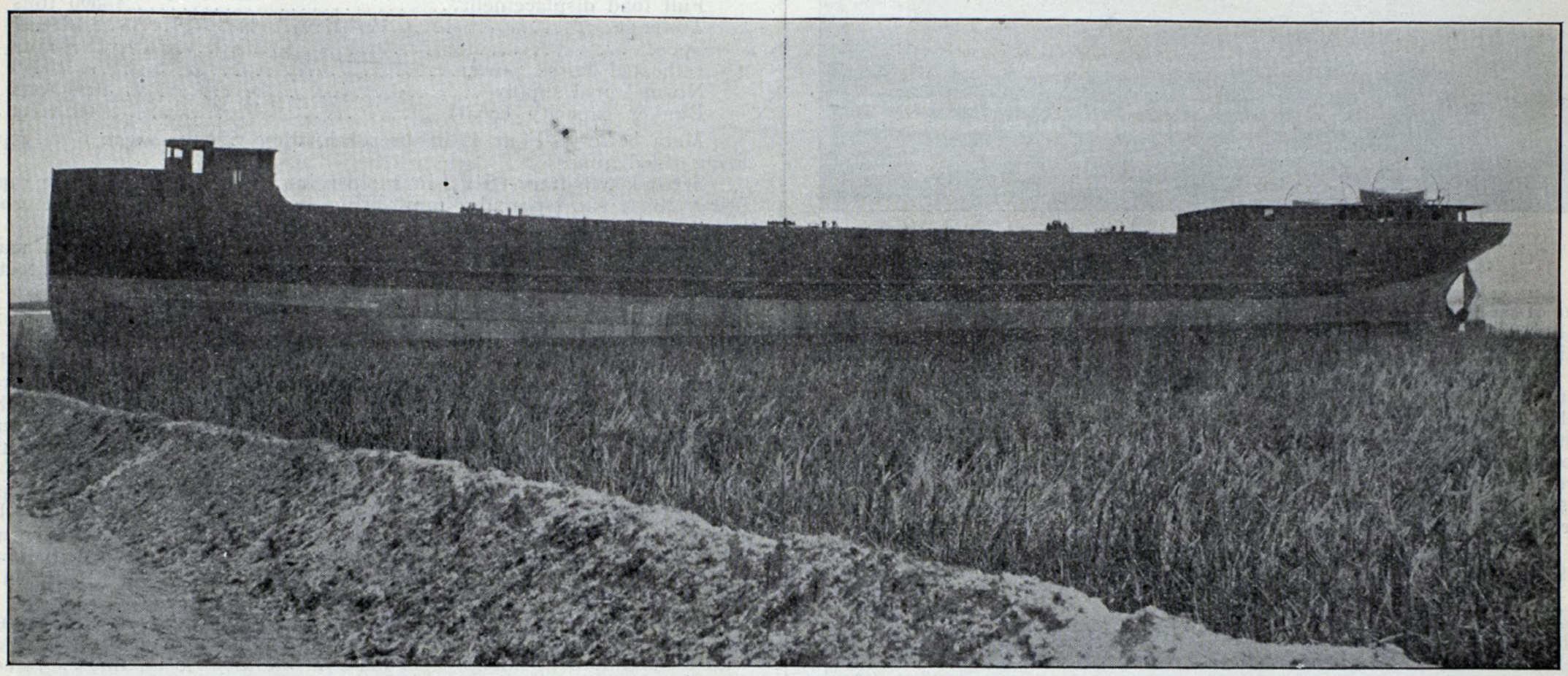
Shamrock II, Sir Thomas Lipton's new challenger for the America's cup, was successfully launched from Denny Bros. yard at Dumbarton, Scotland, last Saturday. A great crowd witnessed the ceremony. Shamrock II is a great departure from previous British designs and will show a resemblance to the Columbia in the water. She is an extreme specimen of the bulb-fin type with very long overhangs. Her counter is cut away and runs to a very fine point at the taffrail. The bow is fuller than anything yet seen, the beams going forward and up to the greatest width opposite the mast. The bilges are strikingly rounded, giving a flat floor. Not much can be seen but a gentle line from amidships to the bow.

The fin keel is in the form of a well with 95 tons of lead run in the bulk of it and tending forward in a cigar shape. The main boom and main mast will be of the finest steel and there will be a telescopic pine topmast. The bowsprit will be pretty far outboard, giving an extensive fore triangle, but the mast will be stepped pretty well forward. The mainsail will be unusually large. The hull frames are of the finest metal steel with a plating of manganese bronze. The deck is of light steel with a thin coating of yellow pine. The sails, which are of cotton, will be supplied by Ratsey of Cowes. The whole effect gives a sense of power and the boat looks as if she might be easily driven in light airs, while she is likely to be a good weather vessel in a strong wind and sea. She appears to be narrower and longer than Valkyrie and as straight on the rail as the Sybarite.

When the yacht is viewed in profile the most striking feature is the extreme fineness of her ends. The overhangs fore and aft are drawn out to exceptional length and the water line underneath looks deceptively short. Her fin is of the medium length, probably 30 ft. at the extreme measurement, and is finished at the bottom with a pronounced rocker. Without doubt the chief characteristic of the yacht's design is the manner in which her beam is thrown right forward, almost into the eyes of the boat. The forward deck lines are carried out full well into the overhang, and the drawing in does not start until half way between the mast and the stern. From about the mast it runs aft in a long curve and goes out into the longest and finest counter ever seen on a cup challenger, the breadth at the taffrail being only about 7 ft. For the purpose of saving weight forward the stem is snubbed off, leaving a small, flat, triangular surface under the bowsprit.

The deck, with its wide lines forward and exceptionally fine run, has the appearance of having been suggested by towing experiments. In the Shamrock I the well defined stem was carried from under the bowsprit to the top edge of the fin, but in the new boat the stem stops short before it reaches the water line. Under this the sections of the boat run in perfect semi-circles and give this part of the hull the exact shape of the forward end of a soup spoon. Some danger of forming an awkward shoulder might have been expected in drawing the wide deck down to the final lines of the under body. But the problem appears to have been successfully met. Every line runs true. The general shape of the bows gives the impression of a boat which should be able to keep her head well up, no matter how hard she may be pressed. It was in this ability to keep her head up that the Columbia's chief superiority over the first Shamrock lay. To take the first Shamrock for a standard for comparison, it may be said that the principle of making the yacht sail over rather than through the water will be pushed very much further in the present yacht. There is none of the flat sides under the bow or big shoulders seen in the Fife boat.

When the yacht is viewed end on, it is seen that Watson has departed greatly from the midship section adopted by Fife. The new challenger is immeasurably easier than the previous boat in the turn of the bilge and garboards, and easier even than Columbia. The fin is narrow in the section where it joins the hull, and spreads until it turns in the round of the trough, in which the lead is carried. The same principle of skimming water is seen in the aft end. All the sections are again in segments of a circle. The total draught from the water line to the bottom of the rockered curve of the keel is only an inch or two over 18 ft., or 2 ft. less than the previous challenger.



A Ship Ashore—Hull of Steamer Uranus on Detroit river bank.

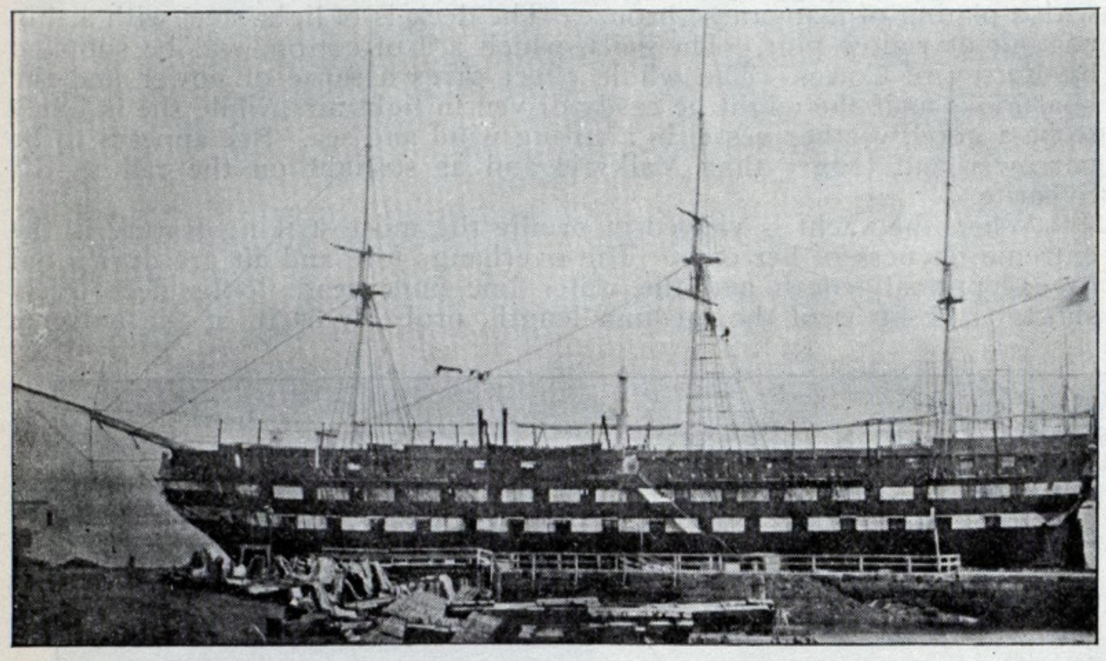
This vessel, being towed up the Detroit river from Wyandotte to Detroit to be fitted with boilers and engines, was driven ashore in the heavy gale of Saturday last. When the river rises, she will be floated without great difficulty, but at considerable expense.

LAUNCH OF BATTLESHIP OHIO.

SHE WILL BE THE THIRD VESSEL TO BEAR THAT NAME IN THE UNITED STATES NAVY—DESCRIPTION OF HER PREDECESSORS.

President McKinley and several members of the cabinet will leave Washington on Monday next for a tour across the continent, the objective point of which is the launching of the battleship Ohio at the Union Iron Works, San Francisco. The vessel whose launching the president will attend is the third of the navy to bear the name Ohio, and it might be interesting to describe the two earlier vessels before setting forth the principal characteristics of the later vessel.

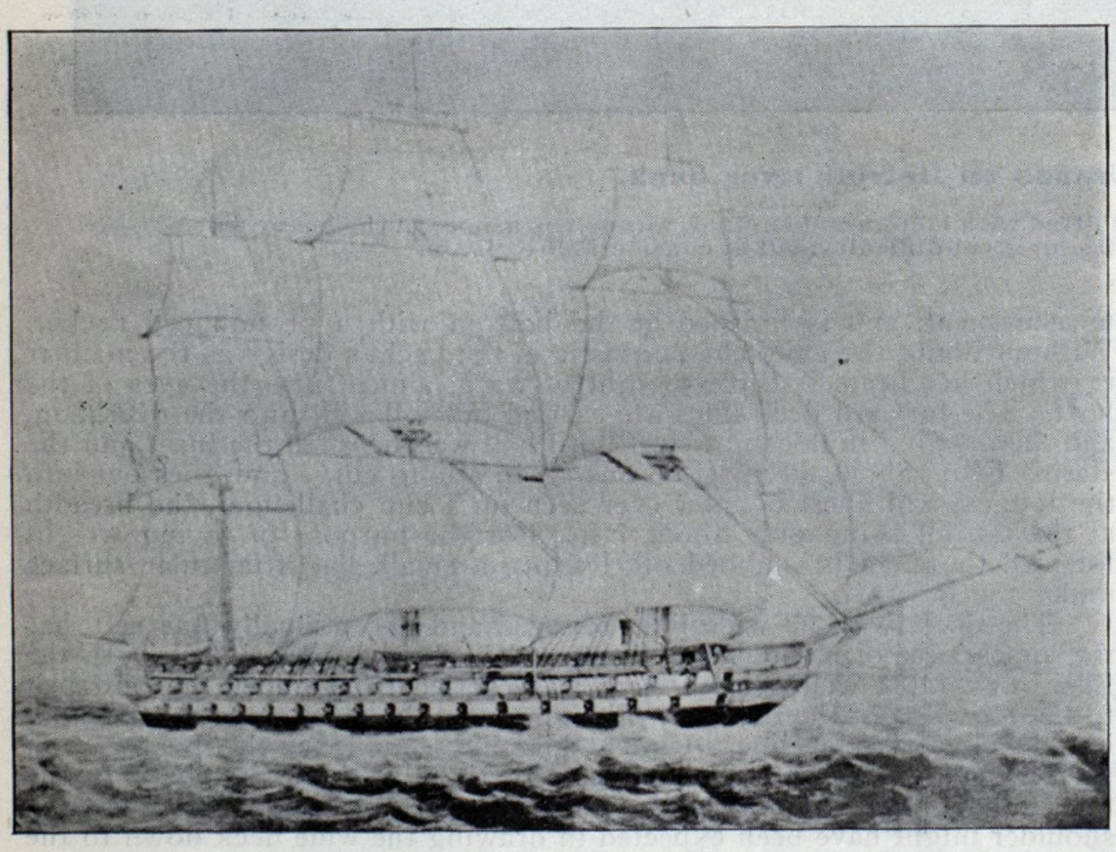
The first Ohio of which we have any record was a small schooner classed as a one-gun vessel, but which in reality was armed with three long 12-pounders and carried a crew of thirty-five men. This vessel was



ONE OF TRE EARLY OHIOS.

one of the fleet assembled on Lake Erie in 1813 under the command of the gallant Oliver H. Perry, but having been ordered under the command of Sailing Master Daniel Dobbins to Erie to look after and forward supplies to the squadron, was unavoidably absent on the occasion of the famous battle that immortalized the name of Perry. On the night of Aug. 12, 1814, the Ohio, Somers and Porcupine, while lying at anchor near the outlet of Lake Erie, on duty protecting the left flank of the American works, were attacked by a force consisting of nine boats carrying seventy-five British seamen, under command of Capt. Dobbs, R. N., and after a desperate encounter, in which the loss on both sides was about the same, the Ohio and Somers were captured, but the Porcupine escaped.

The second Ohio was known as a ship-of-the-line, a seventy-four-gun frigate. This latter term, however, was used arbitrarily to denote rate,



THE SHIP-OF-THE-LINE OHIO.

not the actual number of guns carried. This Ohio was commenced in 1817 and launched at New York in 1820 and proved to be a model of her class. One report of her sea-going qualities says: "Steers uncommonly well; is very sure in stays, and rolls very little under any circumstances"—three qualifications which prove a vessel's success. Her principal data is as follows:

Material	wood
Length	198 ft.
Beam	54½ ft.
Depth of hold	22½ ft.
Maximum draught	26 ft.
Tonnage	2757
Speed, mean	11 knots
Ballast carried	200 tons
Battery—12 8-in. cannon, 72 32-pounder cannon	84 guns
Complement—Officers and men	820
Original cost	$547,889

This vessel also carried 97,000 gallons of water and provisions for five months' cruise. In 1839 she was the flagship of Commodore Isaac Hull in the Mediterranean squadron. In June, 1847, she was sent on special service, conducting United States Minister Tod and suite to Brazil. Under commands of Commander C. K. Stribling and Commodore Thomas C. Jones the Ohio took an active part in the Mexican war, during which she captured the town of Cochari and a number of small vessels. In 1850 she returned from the Pacific coast by the way of the Sandwich islands, Cape Horn and Rio and proceeded to Boston navy yard, which was destined to be her future home. From this time until about 1876 she was used as a receiving ship at this yard, and then "laid up in ordinary" until Sept. 27, 1883, when by order of the navy department she was sold, I. L. Snow of Rockland, Me., being the purchaser, and the amount $17,000.00.

The third Ohio, designed under the supervision of Rear Admiral Philip Hichborn, late chief constructor of the United States navy and chief of the bureau of construction and repair, navy department, is about to be launched at San Francisco. As a warship she is inferior to none, and the peer of any naval vessel in the world. Some faint idea of the great advance in naval architecture from the Ohio of 1820 to the Ohio of 1901 may be conceived by a comparison of their principal data. Particulars of the vessel building at San Francisco are:

PRINCIPAL DATA OHIO AND CLASS (OHIO, MAINE AND MISSOURI)

Material	Steel
Length on load water line	388 ft.
Breadth, extreme	72 ft. 2½ in.
Draught, mean	23 ft. 6 in.
Displacement	12440 tons
Full load displacement	13500 tons
Tonnage	7384.27
Speed	18 knots
Indicated horse power	16000
Normal coal supply	1000 tons
Bunker capacity (coal)	2000 tons

Main battery—Four 12-in. breech-loading rifles; sixteen 6-in. rapid-firing rifled guns.

Secondary battery—Six 3-in. rapid-firing guns; eight 6-pounder rapid-firing guns; six 1-pounder rapid-firing guns; two Colt machine guns; two 3-in. rapid-firing field guns; two submerged torpedo tubes.

Armor—Water line belt, maximum thickness 11 in.; turrets, maximum thickness 12 in.; barbettes, maximum thickness 12 in.; protective deck, maximum thickness 4 in.

Complement of officers, 35; crew, 511; total, 546.

Contract price for hull and machinery, $2,899,000.

The keel of the Ohio was laid April 22, 1899. The vessel is propelled by twin screw, vertical triple expansion engines, supplied with steam from twelve Thornycroft boilers. The armament has been arranged with a view of not "over batterying" the vessel and at the same time allowing sufficient for a vessel of this class. The 12-in. guns are arranged in pairs, two guns in each of the Hichborn balanced turrets, capable of being revolved at the rate of 360° per minute, while the 6-in. guns form a rapid-fire broadside battery. The rate of ammunition supply controlled by electric motors will be for 6-in. guns, six rounds per minute; 6-pounder guns, thirty rounds per minute, and 1-pounder guns at the rate of 100 rounds per minute; illustrating, without further comment, the terrible execution of this type of vessel.

Two military masts are provided for lookout, search-light and small rapid-fire gun purposes. Two conning towers are provided, one forward with a maximum thickness of 10 in., and one aft of 6 in. thickness, connected in the most improved manner with the steam steering gear and in communication with all working parts of the ship. The water tight doors throughout, below the water line portions of the vessel, are operated from a central station so that in case of grounding or other accident the ship is immediately made tight. Complete distilling and refrigerating plants are to be installed. The enclosures and rooms of the officers are to be built of metal, and all wood, wherever used, is to be fireproofed, thereby reducing to a minimum any chance of destruction by fire. Every possible means has been arranged for the health and comfort of the crew, the best thought has been exercised in the ship's design, and it seems unnecessary to say that the builders of the Olympia and Oregon will display the same care and good workmanship in the construction of the Ohio that has characterized all their work, so that the state whose name she bears may find in her not only a namesake, but one of which it may justly be proud.

ANOTHER WILMINGTON-BUILT YACHT.

Despite the inclement weather which prevailed, the Pusey & Jones Co of Wilmington, Del., launched the yacht Cangarda on Saturday last. This boat is a fine schooner-rigged yacht, constructed throughout of steel. She is intended for Mr. Charles J. Canfield of Manistee, Mich., and was designed by H. C. Wintringham, a well-known naval architect of New York city. The yacht's dimensions are: 125 ft. 10 in. length over all; 17 ft. 8 in. beam, molded; 10 ft. 4 in. deep, molded. The keel is built of long bars, 1 in. thick and 6¼ in. deep. The plating is of mild steel with angle bars for frames. There are four water tight steel bulkheads. The deck is of well selected white pine. The pilot house, as well as the deck houses, are of mahogany, ornately designed. The boat is fitted with a flying bridge of mahogany on each side of the pilot house. The forecastle and also the forward rooms are finished in white pine, with flooring of ash. The state rooms for the captain and crew are well finished and fitted with all modern improvements. The cabins are finished in quartered oak and fitted with Hale & Kilburn's safe berths.

The vessel is of the single-screw type with triple expansion engines. The diameters of the cylinders are 9 in., 14¼ in. and 23 in., with a stroke common to all of 14 in. The boiler is of the Almy water tube kind. The shaft is 4¼ in. in diameter and is made of cold-rolled steel.

Wilmington has quite a reputation for building fine pleasure yachts, having already built the Niagara, Alvina, Cangarda and many others.

A dispatch from Trenton, N. J., announces that the Globe Navigation Co., with a capital of $1,000,000, was incorporated there a few days ago. Its stated object is to build and operate steamships and other vessels. The incorporators are William A. Jones, Joseph B. Short and Melville A. Carpenter, all of Newark, N. J.

STEEL SHIP BUILDING IN CANADA.

MR. W. E. REDWAY OF THE POLSON IRON WORKS ANSWERS THE QUESTION AS TO WHY STEEL SHIPS CANNOT BE BUILT AS CHEAPLY IN THE DOMINION AS IN GREAT BRITAIN.

Mr. W. E. Redway of the Polson Iron Works has written an article upon the subject of steel ship building in Canada. He begins his discussion by asking the following question: "Why cannot steel ships be built as cheaply in Canada as in Great Britain? There is no duty on the plates or bars imported for ship building and the extra freight cannot add much to the cost of a Canadian over a British-built ship." He says that a concise but comprehensive answer can readily be given as follows:

"In the first place, a steel ship is composed of something more than the mere framework and plating forming her hull. She contains within herself probably a greater diversity of manufactured materials than any other structure. Into the completion and perfection of a first-class passenger boat go the united productions of almost every manufacturing industry, from the coal and iron mine down through the whole engineering world, from the main engines and boilers to the captain's sextant and chronometer, from the trees in the forest down through the woodworking section, from the main deck to the high-art furniture and carvings in the saloon. Her equipment cannot be provided without the assistance of the cloth-maker, the potter, the glass-worker, the cutler and without the hundred-and-one other members of the world's industrial organization, contributing each his share to the production of the finished article. The cost of almost every article in the ship, coming under either of the above headings, is at least one-third higher in Canada than in Britain. Next, heavy forgings, such as stern frames, rudder frames, connecting rods, propeller shafts, steel engine castings, etc., are considerable items in the cost of a modern steamship. All have to be imported and pay a heavy customs duty, because the larger sizes which are made in Canada and even the smaller sizes which are made here are excessively costly, owing to the extremely limited demand for them. The same remark applies to steam windlasses, steam winches, electric lighting machines, steam steering gears and scores of other items too numerous to mention.

"In all these matters the British ship builder is 25 to 35 per cent. ahead of the Canadian. The latter cannot lay down his raw material (plates, bars and rivets) at so low a price as the former by 10 per cent., exclusive of freight charges, if he desires to save time by purchasing in the United States. However desirable it may be that Canadian makers of these goods should be protected to the extent of this preference during the earlier stages of manufacture, and until an increased demand will justify its discontinuance, that does not make it any easier in the meanwhile for the ship builder who has to compete with those who can obtain the same articles at 25 or 30 per cent. less cost. It is true that a customs tariff of 25 per cent. on machinery and 10 per cent. on the hull is levied on new ships purchased abroad and registered in Canada, which, apparently, is so much in favor of the Canadian builder, but this is purely a negative concession, and is really operative only as to ships purchased in the United States, because British ships registered in Britain or Newfoundland are not subject to the tariff, and, consequently, are brought in freely, clear of duty.

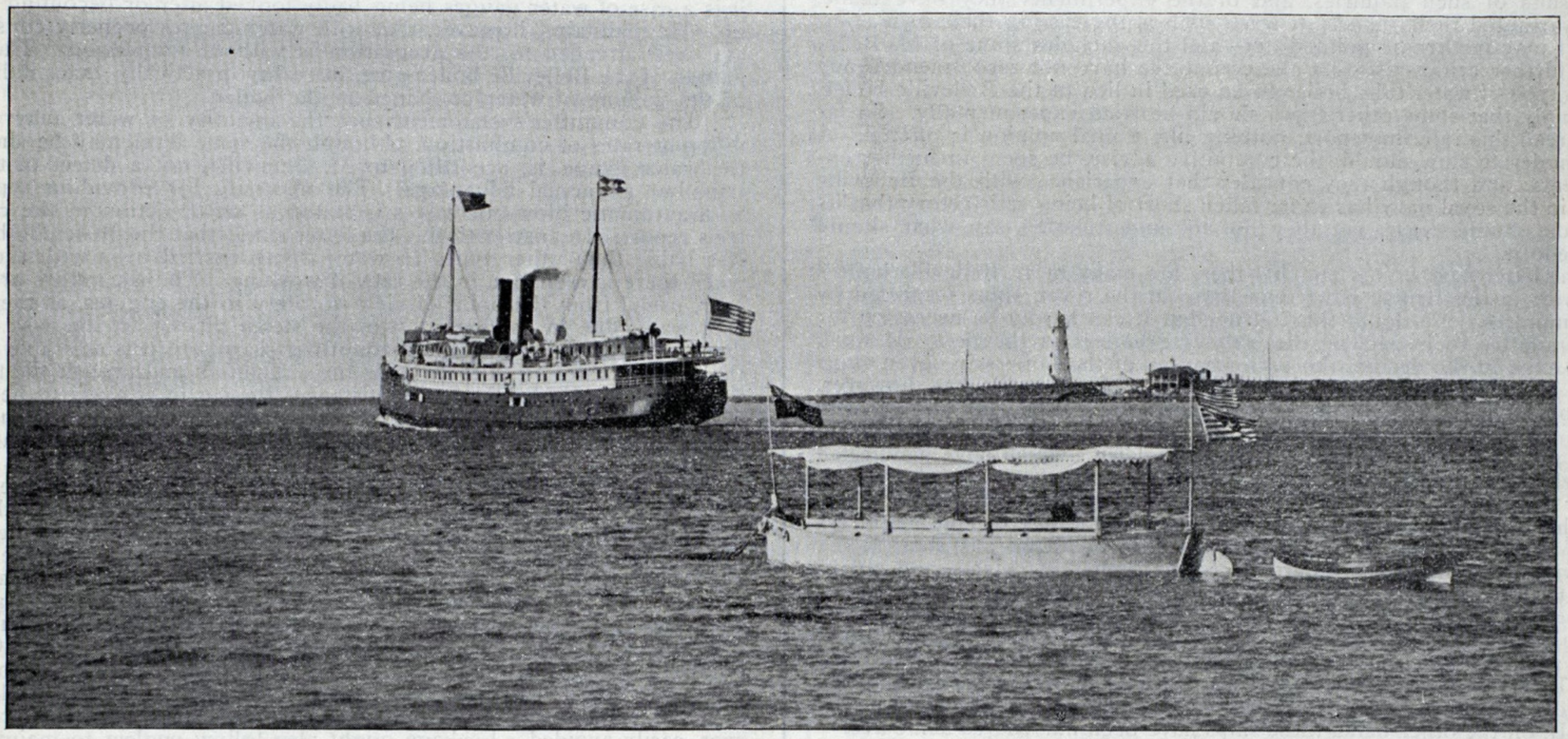
"Then, as to labor: It was recently shown at the meeting of naval architects in New York that the difference in cost of wages paid by day work between American and British ship builders averaged 25 per cent. throughout all trades in favor of Britain. Now, the wages paid in Canada for mechanics and laborers differ but little from the wages paid on the other side, certainly not more than from 10 to 12½ per cent., consequently the British ship builder is also 12½ to 15 per cent. ahead on his cost of labor. Even assuming that the Canadian mechanic, although paid higher wages, can, by reason of his superior energy and ability (which is at least questionable), perform the labor of building the hull at as low cost per ton of material used as the British mechanic, it is still manifestly impossible for the Canadian ship builder to produce the finished ship at the same cost as the British ship builder.

"Many steamers have been brought into Canada during the past ten years from Britain, sufficient in number and importance to have permanently established steel ship building had conditions been favorable for building them here, but the industry has been carried on since the building of the first steel ship, the Manitoba, in May, 1889, in a desultory and perfunctory manner, producing only a class of vessels mostly too small or otherwise unsuitable for crossing the Atlantic; in fact, although the business has had a precarious existence of twelve years, only two cargo steamers have been built during that time. It will be argued that the manufacture of plates and bars in Canada, which is at last within measureable distance, will give the Canadian manufacturer a better chance to compete with the British, and to a limited extent this is true, but it will not go far to offset the wide difference that exists in the general conditions.

"Canada as a manufacturing nation is just emerging from the age of swaddling clothes, but, even after arriving at maturity, she will never be in a position to compete economically with Great Britain in the building of ships, until fiscal and other conditions are so equalized that the Canadian and British ship builder can meet on equal terms. By a wise policy of fostering the manufacture of steel she has laid the foundation stone of her future greatness and prosperity (and no nation in these days can become great before making iron, for that is the condition precedent in this industrial age), but it must not be forgotten that a foundation without a superstructure is of little utility.

"The future development of the iron and steel industry in Canada will require cargo steamers to handle its raw materials and finished products to an extent that cannot be gauged at this moment, and the possibilities of future requirements for moving the products of the northwest, which will be equally in proportion to the growth of the country, are simply incalculable. The coming century will probably witness in Canada a gigantic industrial development similar to that which occurred on the other side of the line during the last century, and the Canadian ship builder is wondering how he is to be able to participate. The only way to create a flourishing and successful industry is to encourage the establishment of works in which everything necessary for the building and equipment of a ship from keel to truck shall be made right here in Canada and to provide some means whereby the Canadian ship builder can obtain an equivalent for the superior conditions enioyed by his British rival.

"Our astute friends and neighbors to the south realize the magnificent possibilities foreshadowed by the creation of a merchant marine, and are organizing a national attempt to place the ship builders of the United States upon an equal footing with those of Great Britain and Germany (other nations do not count in this connection), and they propose to spend $20,000,000 a year for the next nine years to achieve that object. Who can doubt that such a step will prove a profitable investment, or that its effect will have world-wide reaching consequences? What better precedent can be found for similar action on this side when the conditions are so nearly alike? Until something of the kind is accomplished, steel ship building will continue to languish in Canada, for capitalists are naturally conservative, prone rather to embark in undertakings where a moderate return is certain, than to venture into the realm of experiment where the alluring brightness of possible results is too often obscured by events unforeseen and unprovided for. This subject forms an essential portion of the still unsolved transportation problem, the most vital public question of this generation to the people of Canada. The construction and enlargement of the canals of the Dominion have cost over $70,000,000, but where are the Canadian cargo steamers which should be utilizing them on the great lakes? Unfortunately they can almost all be counted on one's fingers, and those mostly British-built ships. Until means are adopted for fostering the construction of steel ships in Canada the transportation problem will remain unsolved, and the first story of the superstructure of Canada's future greatness (to be raised upon the foundation laid by the manufacture of iron and steel) will remain unbuilt."



THE PLANT LINE STEAMSHIP MIAMI, WHICH COMES TO THE LAKES THIS SEASON.

The tenth annual convention of the International Longshoremen's Association will be held in Toledo, beginning July 10.

M. DELAUNEY BELLEVILLE'S REPLY.

HE ANSWERS SEVERAL OF THE POINTS IN THE INTERIM REPORT OF THE BRITISH ADMIRALTY COMMITTEE—THINKS ENGINE ROOM STAFFS INEFFICIENT.

M. Delauney Belleville, the designer of the Belleville boiler, has addressed two letters to the secretary of the British admiralty upon the interim report of the admiralty committee upon the subject of the Belleville boiler. He attributes the disasters to the Belleville boiler that have occurred in the British navy partly to the failure of British constructors to make the boiler properly but more especially to the inefficient manner in which the boiler has been operated by the engine room staffs.

Both letters have been discussed thoroughly in the columns of the British technical press. Engineering of London, which is inclined to give the Belleville boiler a fair show, says:

The first point criticized is contained in the paragraphs in the committee's report in which it is stated that the water tube boilers should be preferred to the cylindrical type, supposing a satisfactory example can be found, and that the Belleville boiler does not appear to possess the advantages over other types of water tube boilers for use in the navy. M. Belleville considers this opinion would only have been warranted if the boiler had ceased to be used on a considerable scale for sea-going purposes since the Powerful and Terrible were tried; and, further, supposing the admiralty had made extensive trials of other types of water tube boiler. We do not quite follow this reasoning. The boiler committee were commissioned to inquire for themselves, and it is to be presumed the results of such inquiries, and of the experiments they have made, have warranted their report; at least, such is the case in their own opinion. It may further be pointed out—and this includes some of M. Belleville's further criticisms—that the committee have not recommended any special type of water tube boiler to be used in lieu of the Belleville boiler, but simply that some other types should be tried experimentally. So far as we read this interim report, nothing like a final opinion is offered. A very moderate sum should, the committee advise, be spent in further experiments; and though they consider that experience with the Belleville boiler in the royal navy has so far fallen short of being satisfactory that its adoption should cease, yet they do not undertake to say what should supersede it.

The letter next points out that there are many more Belleville boilers in service in the British navy than those in the seven ships inspected by the committee. No doubt this is true; but it can hardly be necessary for the committee to inspect all the Belleville boilers in the fleet. If weak points exist in the design, the performances of the boilers in seven ships would be sufficient to make them manifest. M. Belleville has, however, right on his side when he states that there are armor-clads and cruisers on the China station, having Belleville boilers, which have acted satisfactorily. The point that arises is whether the defects which have manifested themselves are normal to the design, or whether they have been due to improper treatment. M. Belleville maintains the latter view; but, on the other hand, we are bound to suppose that a committee of able engineers would have this point in view and would not condemn a system unless they were assured that its failure was due to inherent defects, and not to unfair treatment, under what would be defective construction, or the average service of a war vessel. What we should like to be assured upon would be that the vessels referred to in the China seas had been tested to the point to which armor-clads and cruisers would be tested in actual war. If M. Belleville could assure us of that, he would certainly bring forward a strong argument in favor of the retention of his boiler in the fleet. If, on the other hand, these ships have been nursed—as some aver—because they are known to be of weakly constitution, then the example of the China squadron cannot be adduced as favorable evidence. We but suggest an obvious case. We have no evidence one way or the other; and, of course, would be glad to publish any well authenticated details on this important subject.

Turning to other navies, M. Belleville's letter asks whether it is not a fact that, in the French service, a number of ships fitted with his boilers have made long voyages always of a satisfactory nature. He points out that the Japanese admiralty have recently written to the constructors of the cruiser Azuma, built in France, congratulating them upon the excellent results on the first voyage of the ship to Japan. The long and satisfactory experience of the Messageries Maritimes vessels with Belleville boilers in also insisted upon. M. Belleville states that three members of the boiler committee visited two of the Messageries ships—the Indus and the Laos. The latter vessel was the first to be fitted with economizers, and the tubes, after a service of three years, were not corroded. M. Belleville thinks it is to be regretted that this fact was not included in the committee's report. Moreover, it is said, an admiralty inspector made a voyage to China in the Indus. It would tend to the elucidation of the truth if this officer's report were made known to the committee and were published with their report. The letter further states that not one of the Messageries mail steamers fitted with Belleville boilers has been prevented from running by the failure of her boilers.

Turning to the points in the admiralty report in which the defects of the Belleville boiler are set forth M. Belleville deals with them in order. The first refers to the circulation of water, which is described as defective and uncertain, because of the resistance offered by the great length of tube between the feed and steam collectors, the friction of the junction boxes, and the small holes in the nipples between the feed collector and the generator tubes; which also are liable to be obstructed, and may thus become a source of danger. M. Belleville says in effect that these objections are answered by the results of practical experience. But were it not so he would be able to meet them by theoretical considerations. He has made workshop trials expressly to test the question of circulation, and has found by them—in what manner is not stated—that the quantity of water which circulates in the elements is six to ten times greater—according to the conditions of working—than the volume of water evaporated. This, the writer of the letter considers, is confirmation of the certainty and regularity of the circulation in the Belleville boiler. As to the small diameter of the nipples at the bases of the elements, this, he maintains, ensures the equal distribution of the feed water. In regard to obstructions, it is pointed out that this diameter, in boilers of large ships, is 40 millimeters, or greater than the interior diameter of the tubes of the boilers of torpedo craft. Moreover, it is larger than the space between the interior and exterior tubes of the concentric tube type of boiler.

The letter next deals at some length with the committee's objection to the necessity of automatic feed arrangements. M. Belleville points out that all water tube boilers, owing to the small quantity of water contained, need regular feed supply; and this, he states, it is practically impossible to secure by hand methods. He considers that in battle the number of men required for the purpose could not be spared. It is also stated that the Messageries ships have been run—contrary to instructions—with the water gauge cocks closed, and the automatic feed apparatus has maintained the proper water level. The next objection of the committee was the great excess of pressure in feed pipes and pumps over the boiler pressure. In reply to this M. Belleville states that this excess of pressure is useful in all installations of groups of water tube boilers fed by the same pump whatever the system of boilers. This excess of pressure assists the feed regulator in maintaining the proper amount of feed to the boilers individually, in spite of slight differences of pressure due to variations in firing or cleaning of grates. With good construction this excess of pressure should cause no inconvenience.

The committee also objected to the excess of boiler pressure over the working pressure in the engines. In regard to this the writer of the letter points out that the difference in pressure is useful with all types of water tube boilers. At one time it was looked on as an objection in the French navy, but experience has proved the desirability of this method of working, so that, even where Belleville boilers are not installed, reducing valves are fitted. The objection of the committee that the true level of water is not shown with certainty by the gauges on Belleville boilers is met by the statement that this applies to all boilers, without exception, if it is a case of water gauges being badly looked after or becoming choked up. He maintains, however, that with water gauges properly constructed and well attended to, the accusation is without foundation. The water gauges of the Belleville boiler give, in reality, practically exact indications of the volume of water contained in the boiler.

The committee's statement that the quantity of water may vary at different rates of combustion, although the same level may be shown by the water gauge, is, according to M. Belleville, not a defect of the system, but an actual advantage. The necessity for providing separators with automatic blow-out valves is stated as an objection in the committee's report. In answer to this the letter states that the Belleville boiler is less liable than other types to water being carried over with the steam when there is a change in the rate of working. The separators are, however, useful from the point of view of safety to the engines, as they intercept water due to condensation in the steam pipes. In the case of condensor tubes leaking badly and admitting sea water, it is desirable to raise the level of water so as to increase the circulation and protect the tubes of the elements. Under these circumstances the steam is likely to be wetter, and the condensation in the pipes will be more serious. The automatic blow-out valves provide against injury from this cause even when it is excessive.

The constant trouble and loss of water resulting from the nickel sleeve joints connecting the elements to the feed collectors was the next defect mentioned in the report. Dealing with this, M. Belleville points out that trouble from losses of water is practically unknown on the vessels containing Belleville boilers constructed in France. This was a fact, it is claimed, of which the members of the committee who visited Marseilles were able to convince themselves, and the admiralty inspector who made a voyage in the Indus had also an opportunity of a like nature. On this point M. Belleville points out that defective construction of cones on which the nickel sleeves are placed, improper fittings, or the employment of brittle metal, might cause the defects alluded to. Such faults are, however, easily avoided. Leakage might also follow neglect to maintain the boiler in proper working condition, through allowing saline or grease deposits to accumulate, so that the metal would be over-heated and the tubes distorted. It is not difficult, however, to prevent the deposit of salt or grease when proper precautions are taken. The losses of water referred to in the report, are, it is stated, practically unknown whenever proper precautions are taken in the construction and subsequent working of these boilers.

The liability of upper generator tubes and economizer tubes to fail by pitting, to which the report of the committee refers, is not, M. Belleville states, confined to his type of boiler, but has for long been observed in all kinds of boilers—not excluding cylindrical boilers—in the navies of different powers. Neither fire tubes nor water tubes are exempt from corrosion. The precautions necessary to prevent deterioration from this cause are simple, and the writer of the letter asks why they have not been observed. The matter is to M. Belleville inexplicable, and he exclaims against such precautions not being observed in all vessels supplied with the Belleville boiler. The boiler should not be held responsible for the neglect of the most precise and practical instructions in this respect. In this part of the letter he does not mince matters, and M. Belleville evidently considers the time has come for plain speaking. He goes on to say—in reference to the statement of the committee that the engineers had not been instructed in the best method of preventing corrosion—that, though the engineers had been instructed in what should be done, they had neglected to observe the precautions recommended, notwithstanding that the results obtained in numerous other vessels had proved their efficacy. This latter fact the members of the committee, who had visited Marseilles, might have seen for themselves.

That the upkeep of the Belleville boiler is more expensive than that of cylindrical boilers—another objection raised by the committee—is, M. Belleville considers, a point of great importance; but it is practically answered by reference to the committee's statement that the engineer officers in charge of the Belleville boilers had not been made acquainted with the best method of working the boilers, and by evidences of bad construction. It is considered that as experience is gained the expense of upkeep will decrease. Reference is made to the facility with which the Belleville boiler is repaired. It will be remembered that the boiler committee considered that as the Belleville boiler needs additional evaporating plant and requires more coal on ordinary service, the saving in weight, as compared with cylindrical boilers, is nullified to a great extent. It was doubtful, therefore, whether any real advantage had been gained in radius of action. The committee also stated that they were not prepared to say, without further experience, to what extent this might not apply to other types of

water tube boilers. In reply to this, M. Belleville states that, in other navies and in mercantile vessels, it has not been found necessary to supply additional evaporating plant. The circumstances which had led to the remark of the committee are exceptional, and the responsibility for them ought not to fall on the Belleville system. Loss of water would be due to defective construction, to the boilers being improperly worked, or to the multiplication of auxiliary machinery and the ramification of pipes which it necessitates. The very great difference in the consumption of water in different ships, according to the manner in which their machinery has been operated, would prove that it is not the boilers that are in fault. In regard to the greater consumption of coal on ordinary service, spoken of by the report, M. Belleville finds it difficult to discuss the point in the absence of full information. He points out, however, that there has been an improvement on trial of the Belleville boiler as compared to the cylindrical boiler, and he asks why the same results are not reached in ordinary service. The only reason he can assign is that the engineering staff possess a more perfect knowledge of the way to run cylindrical boilers, whilst faulty instruction (it may be lack of instruction) prevents proper results being obtained with Belleville boilers. Another explanation he puts forward is that the proportions adopted for grate bars in ships of the royal navy are not suitable from the point of view of ordinary running. The bars are 15 millimeters (.59 in.) wide, and the same distance apart. On trial the coal is picked so as to be in suitable sized lumps, and, moreover, the stoking is carefully carried out. Under these circumstances satisfactory results are to be obtained with this arrangement of grate; although even for land purposes, M. Belleville considers, the proportions are not satisfactory. At some trials made on shore at Barrow with two of the boilers of the Powerful, M. Belleville's engineer obtained a notable increase of efficiency by reducing the spaces between the bars.

Under ordinary service conditions, M. Belleville points out, coal is used as it comes, and stoking is done with much less care than during trials, so that the defect of too wide spacing of grate bars is more apparent. A good deal of coal falls unconsumed between the bars; whilst too much air passes up through the fire. This latter defect is emphasized when the flame ascends vertically, more especially if the apparatus for injection of air under pressure above the fire—as adopted in the Belleville system—is not in operation. When the boiler room staff has had little experience in the management of fires from which the flame ascends vertically, or when the proper instructions for working the boiler are neglected, it is especially needful to insure the mixing of the gases by the means to which reference has been made.

The increased radius of action due to the use of Belleville boilers will, M. Belleville maintains, be secured when the engineering staff is able to get a maximum effect from the boilers confided to their care. The paragraph in the boiler committee's report which M. Belleville thinks will attract most attention is that in which it is stated that to obtain satisfactory results in the working of the Belleville boiler more than ordinary experience and skill are required. However that may be, M. Belleville points out that the engineering staff ought to be endowed with other experience, and to possess other notions, than those acquired in the working of cylindrical boilers. He points out, very justly, that the new water tube boilers, among which he classes the Belleville type, are entirely different in their principle, construction and working from any shell boiler. The methods of stoking are not the same for an ascending flame as for a boiler in which the flame is directed in a horizontal direction. New apparatus needs new practice.

In a previous letter to the admiralty, M. Belleville had pointed out that in other navies the necessary instruction on the running of the boiler was obtained by long intercourse between the engineering staff of the ships and that of the Belleville boiler company. The appliances and machinery necessary to the boiler are examined during this course, and their use is explained. It is, M. Belleville says, certain that the constructors to whom the admiralty entrust the execution of the Belleville boilers are not as well acquainted with all details of the design as are the French makers. The British contractors are less imbued with the value and raison d'etre of each part, and in consequence are less apt to appreciate their importance. Under these circumstances it is certain that steps should be taken to remedy this defect.

The admiralty had previously written to M. Belleville asking him whether he considered it desirable to do away with the economizer type and return to the Powerful type of Belleville boiler, as advised by the boiler committee. In reply to this, M. Belleville stated that, even with ordinary working, the consumption of the economizer type was on an equality with the non-economizer type. But the advantage of the economizer is so considerable with high rates of evaporation that it ought to be used. He points out that the economy of coal in ordinary working is a matter for consideration from the point of view of expense, but in time of war to spare coal in forced working is much more important. This consideration, he thinks, is sufficient to warrant the use of the economizer; an opinion that was adopted by competent authorities when he studied the question of adding the economizer. In addition to this, however, experience has shown that even with moderate rates of evaporation the economizer gives a better efficiency than the older design. This conclusion is supported by experience, many times repeated, both under the admiralty engineers and also the engineers of the French navy, as well as those of many technical associations. If, in the experience of the admiralty, the same results have not been reached in ordinary service at sea, M. Belleville can only attribute the fact, in a great part, to the inexperience of the staff.

The admiralty also asked M. Belleville's opinion as to the expediency of raising the tubes higher above the fire bars, to increase the combustion space—a modification advised by the boiler committee. What we have already quoted in regard to the arrangement of fire bars bears on this point, the defects referred to influencing the amount of coal consumed. A design had been submitted to M. Belleville in which the space for combustion had been increased, and he asks for facts which warranted the change. He found nothing of the kind in the report, and concluded that the idea as to advantages to be obtained rested on theoretical considerations; to these he opposed the results of numerous trials and long practical experience. With coke or anthracite the change would be advantageous. On the other hand, the increased space would be unfavorable with a more richly gaseous coal. This would follow from the increase of radiating surface of the furnace, which would cause too quick a liberation of the gases, and render their complete combustion more difficult. The clinker also would be hotter, and therefore more fusible, so that cleaning the fires would be more laborious. The greater depth of the combustion space would also necessitate a higher furnace front leading to a larger area of exterior radiating surface. This would make the stoke holds much hotter, and more trying to the men. The boiler committee had also advised an increased diameter of the steam collector drum; and, in reference to this, M. Belleville points out that a greater thickness of metal would be needed; experience had shown him that larger proportions than those adopted were not advantageous. A slight increase might, however, be admissible, with no other disadvantage than increased weight. The last point touched upon in M. Belleville's second letter is the use of cylindrical boilers for auxiliary purposes. This, he thinks, is not a matter of very great importance, the chief point being the reduction of auxiliary engines, their more efficient use of steam, and their grouping so as to reduce the length of steam pipes. The use of exhaust steam, and, above all, the substitution of electric motors for steam engines are also suggested.

STEAM YACHT ALVINA.

The steam yacht Alvina, built by the Harlan & Hollingsworth Co., Wilmington, Del., for Charles Fletcher of Providence, R. I., left the wharf of her builders last week for Providence. The Alvina is a veritable floating palace and cost $250,000. The vessel is a steel twin-screw steam yacht with the following dimensions: 215 ft. over all, 178 ft. water line, 26 ft. 8 in. beam, 11 ft. 6 in. draught. She is to be rated 100 A1. In the hull there are seven water tight bulkheads and two laid decks. At the forward end above the main deck are a forecastle deck, under which are arranged the windlass, crew's mess, firemen and oilers' quarters; also a large galley for officers and crew. There is a long continuous deck house extending from just abaft the foremast to just abaft the mainmast. In the forward end of this house is the dining room, aft of which is a hallway on the starboard side, connected with a covered passageway leading aft. The pantry and galley of the owner are situated on the port side of the deck house, boiler inclosure, a large laundry and engine room casing, then a library, large stateroom and hallway complete the whole deck house accommodations. On top of the main deck house and just forward of the smokestack is a structure in which is arranged the captain's room and a chart room.

The yacht will be steered from a flying bridge above this structure, pipe rails surrounding the space. She is schooner rigged and will carry three boats on a side, one on the starboard side well aft to be steam or naphtha launch. Going below through finely fitted companionways, the visitor will find the accommodations very roomy. Beginning forward under the decks are located the sailors' quarters, then the officers' quarters and next aft three large staterooms, besides owner's bath room, coal bunkers and machinery space. Further aft there are five staterooms of good size, three being very large, also two bath rooms and a large cabin. The yacht's finish is most elaborate throughout and she is built strongly and with great care. Arrangements have been made for water ballast, and for this provision she is fitted with two large tanks, one forward of the machinery space and the other aft of it.

The yacht will be driven by two sets of triple expansion engines, together developing 1,300 H.P., natural draft. Steam will be furnished by two Scotch boilers, and there also is a donkey boiler. Auxiliary machinery, consisting of air and feed pumps, two electric light plants, evaporator, distiller and ice-making machinery is installed. There is a bunker capacity of 170 tons of coal. The contract speed of the Alvina is 14 nautical miles an hour for a four hours' run. She is intended for long voyages, and will probably be taken to Europe this summer. She has a waist of good depth, with bulwark rails constructed from just abaft the foremast to the stern. A brass rail is placed on the sides forward of the foremast. The bow and stern have characteristics of the big steam yacht Corsair. The Alvina was designed by A. S. Chesebrough, who superintended her construction. Mr. Fletcher holds membership in the New York and Bristol yacht clubs.

STATISTICS OF VESSEL LOSSES.

Lloyd's register of shipping has issued statistics showing the number, gross tonnage and nationality of steam and sailing vessels totally lost, condemned and broken up during the quarter from July 1 to Sept. 30, 1900. Vessels under 100 tons gross are not included in the return nor are the vessels lost on the great lakes. Following is the summary:

	Total.			Percentage lost (Steam vessels)		Total.		Percentage lost (Sailing vessels)	
	No.	Tons. Net.	Tons. Gross.	of vessels owned.	of gross tonn'ge owned.	No.	Tons.	of vessels owned.	of tonng'e owned.
United Kingdom	21	17,131	27,917	0.30	0.24	24	12,982	1.27	0.75
British Colonies	4	3,184	5,645	0.44	0.89	6	2,057	0.59	0.54
United States	3	1,505	1,954	0.43	0.22	16	11,247	0.75	0.97
Austro-Hungarian	.....	.....	.....	.....	.....	.....	.....	.....	.....
Danish	1	183	342	0.27	0.08	4	2,286	0.92	2.14
Dutch	4	1,432	2,588	1.38	0.55	1	356	0.85	0.56
French	4	4,131	7,586	0.60	0.72	4	3,563	0.72	1.19
German	2	1,499	2,212	0.17	0.10	7	5,788	1.40	1.18
Italian	1	568	1,038	0.32	0.19	9	4,261	1.04	0.96
Norwegian	7	5,910	9,499	0.87	1.24	21	12,658	1.33	1.44
Russian	.....	.....	.....	.....	.....	8	2,360	1 06	0.94
Spanish	2	3,867	6,215	0.47	0.97	.....	.....	.....	.....
Swedish	.....	.....	.....	.....	.....	5	898	0.66	0.41
Other European countries	1	1,045	1,622	.....	.....	3	1,514	.....	.....
Central and South America	1	1,042	1,893	.....	.....	4	2,198	.....	.....
Asia	3	3,885	6,267	.....	.....	.....	.....	.....	.....
Other countries	.....	.....	.....	.....	.....	.....	.....	.....	.....
	54	45,382	74,778	.....	.....	112	62,168	.....	.....

The contract for the protected cruiser Milwaukee has been awarded to the Union Iron Works, San Francisco, at $2,825,000.

SUBMARINE SIGNALING.

A DESCRIPTION OF THE SYSTEM DEVISED BY ARTHUR J. MUNDY AND PROF ELISHA GRAY—RECENTLY TRIED IN BOSTON HARBOR.

The Review noted recently a test of the Mundy system of submarine signaling in Boston harbor. A description of this system has just been published in Pearson's magazine by Chauncey S. Stevens Miller, from which the Review makes both condensation and abstract, protecting, however, the copyright in Pearson's magazine. The system is the invention of Arthur J. Mundy of Boston and Prof. Elisha Gray of Chicago. It was at Mundy's summer home at Cape Ann, Mass., that Prof. Gray worked out the idea of wireless submarine signaling. Three weeks before his death Prof. Gray had the satisfaction of seeing a dozen men of brains and assured business standing express their delight over the entire success of a practical demonstration by signing the following statement:

"We have this day heard the submerged bell (struck electrically from the experimental station on board the Sea Bell) through the electrical receiver (submerged from the deck of a steamer engaged for the purpose) at a distance of 1¼, 4, 8 and 12 miles in open sea. At 1 and 1½ miles the sound of the bell was heard very loud and very distinctly; at 4 miles the sound was quite as distinct and almost as loud as at 1½ miles; at 8 miles the sound was quite as distinct as at 1½ miles, and almost as loud as at 4 miles; at 12 miles the sound was heard at times quite distinctly and at times somewhat feebly. Even at 12 miles the sound received was sufficient to give a practicable warning signal. The bell was also heard in the fore hold of the steamer, without any receiving apparatus whatever, at a distance of one-quarter mile so loud that it seemed to be right alongside the ship; and at a distance of 1½ miles it was heard faintly but unmistakably in the same position in the hold and without any apparatus for detecting sound."

Step by step the inventors proceeded, until the time came to build a movable experiment station, and the scow appropriately christened the Sea Bell was designed and built for their especial needs. She has a well-hole cut in the center of the hull, through which the bell is lowered with apparatus for ringing it electrically. A six-horse-power gasoline engine furnishes the power for a small dynamo. The bell is lowered into the sea through the well hole to any desired depth by a windlass, and an ingenious electrical mechanism enables an operator to ring the bell continuously as a church bell is tolled, or to sound any desired number of strokes at will. Hence, it is impossible for one to send intelligible messages if each letter of the alphabet be represented by a given number.

DESCRIPTION OF THE METHOD OF OPERATION.

On a keyboard similar to that of a typewriter the inventors have placed seven keys connected by wires from the dynamo to a commutator operating the bell. On an engraved tablet, fastened in front of the keyboard, the letters of the alphabet duly numbered are shown, enabling an operator, either on shipboard or ashore, to send any desired message. The message "All well here" would be sent in this way:

XXX	ALL	X	WELL	X	HERE	XXX
12-12-12	22-33-33	12	51-21-33-33	12	15-21-32-21	12-12-12

It is obvious, of course, that instead of suspending a bell from a vessel it might be hung from a buoy and permanently anchored under water at any depth desired, and at any reasonable distance from the shore. In such a case the current for operating the clapper would be brought to the bell from the shore via a submarine cable. The advantage of having such off-shore telephone booths, as it were, is palpable and striking.

With regard to the reception of messages, the picking up of submarine sounds is equally effective. The inventors devised a great variety of receivers operated pneumatically, electrically and mechanically; carefully and exhaustively testing the comparative efficiency of the instruments. The simplest mode of hearing such submerged bell signals on board ship is to go below into the hold of the vessel, as close to the keel as possible without any apparatus whatever, and simply listen. At a distance of a mile or more the sound of the bell may be distinctly heard by the unaided ear. It comes through the water and passes through the sides of the ship into the atmosphere of the hold, and is there recognized by the ear just as any local sound might be. Placing one end of a wooden rod against the skin of the ship, the other end being held against the ear, the sound is heard at even a great distance.

A common tin ear trumpet, such as is used by a deaf person, screwed on to the end of a piece of gas pipe, the mouth of the trumpet being sealed by a tin diaphragm, and submerged 6 feet under water, enables the observer, at the upper end of the pipe, to hear the submerged bell at a distance of 3 miles. For greater distances the inventors have constructed an electrical receiver, by means of which the bell has been heard distinctly a distance of 12 miles. The submerged end of this receiver may be lowered over the side of the ship, or attached to it on either side of the bow, under the water line, like a pair of ears. The submerged portion of the receiver is connected by wires to a telephone receiver, which may be carried to any part of the ship—say the pilot house—where the navigator can listen for the sound of the bell.

Prof. Gray devised an improvement for the electrical receiver by means of which a large gong will be rung automatically in the pilot house or any other part of the ship, whenever the submerged bell is rung. That is to say, the gong rings sympathetically, following the bell, stroke by stroke, there being no connection between them other than the sound waves travelling through the water from the bell to the ship.

A PRACTICAL ILLUSTRATION GIVEN.

To give a practical illustration, suppose a bell was submerged off the treacherous Diamond shoals, where it has been impossible to erect a light-house, and whence light-ships have been frequently torn adrift by the fury of the wind and waves. It is entirely practicable to run a cable a dozen miles out to sea over the ocean floor, and thence upward to a buoy submerged sufficiently below the turbulent surface to be secure at all times. Equip this bell with an electrically swung clapper, rung steadily or at stated intervals from the shore station, and any vessel coming within 2 or 3 miles of this unseen, but always to be heard, sentinel will be warned of her danger automatically by the strokes upon the gong in the pilot house.

Ships are often lost by getting out of their course and coming to grief at the very moment when the navigator thinks he is perfectly safe, and is therefore keeping no special lookout. The apparatus will be always on the lookout, sounding an automatic alarm whenever necessary. Such a signal anchored near Mile rock, within a mile of the San Francisco shore, would unquestionably have prevented the wreck of the steamship City of Rio de Janeiro, which occurred during a heavy fog last February, causing the loss of 128 lives and over a million dollars' worth of property.

A moment's thought will suggest several uses to which these submarine signaling devices may be applied. The first, and perhaps the most important, is to enable the navigator to determine with precision his position at sea when within ten or a dozen miles off shore. Both the British and the United States governments have spent a great deal of money and time in trying to secure an atmospheric fog signal that can be always depended upon in any condition of weather, but without success. The perverse conditions oftentimes obtaining in the atmosphere do not exist in the water, as has been stated, for that element has a uniform density, and therefore a sound, once started, will radiate in all directions steadily and without deviation or reflection.

It is proposed by the inventors to station along the coast at intervals of, say, 10 miles, a series of submerged bells to be thus run electrically from a shore station. These bells will announce their identity either by ringing each a different serial number or by sounding a different pitch. Their position will be charted, so that the navigator hearing the number or pitch will identify each bell and locate its geographical position, night or day, in fog or sunshine.

Before he died Prof. Gray had designed a great improvement over the receiver that had been used in the earlier experiments. This receiver will enable the navigator to tell with wonderful precision at which point of the compass the bell is located, and when the vessel is within the hearing of two bells, knowing the angle of each, he can pick out his ship's position on the chart within a couple of cable lengths.

HOW A SHIP MAY FIND HER WAY INTO THE HARBOR.

Mr. Mundy has invented and just patented an ingenious method by means of which a ship coming in from the open sea may find her way straight to the entrance of a harbor by simply feeling her way along until she finds herself in any position where the sounds from two bells, one on either side of the entrance, are heard simultaneously on board ship. These bells are placed at equal distances from the entrance and are rung by cable connection at precisely the same instant. As sound travels at a fixed speed in the water (just as it does in the air), the vessel must be equi-distant from the bells in order to hear them simultaneously. The bells have different pitches, so that if the navigator hears the higher toned bell first he knows he is somewhat nearer to it than to the lower toned bell, and therefore somewhat to the north of the straight line shown on his chart which leads directly to the mouth of the harbor. If, on the other hand, he hears the lower toned bell first he knows he is south of this charted line. The length of the time interval between the two sounds will give him an approximate idea of about how far away he is from this charted line. Thus guided, he bears either north or south until he reaches this line where the two bells are heard simultaneously, and then his chart tells him the exact course by the compass to the mouth of the harbor, which he can maintain and verify by keeping the sound of the bells in simultaneous relation. This system does not require the use of Prof. Gray's receiver, which determines the direction from whence the sounds originate; the two methods may, however, be used to confirm each other.

A further elaboration of this principle, termed "acoustic triangulation," is effected by the addition of a third bell placed in triangular relation to the other two. With three bells thus related and sounded, not simultaneously, but successively at intervals of ten seconds, the navigator can prick his position on the chart within a ship's length when 10 miles from shore, by simply noting the intervals of time elapsing between the sound signals as he hears them aboard ship. Another phase of this wireless marine converzatione is the facility with which intelligible messages may be sent back and forth between vessels of a squadron, a flag ship and a shore station within a radius of 12 miles, etc. Light-ships like those off Fire island and Sandy hook can be kept in constant communication with the shore; hitherto impracticable because the swinging of a vessel around her mooring chain necessarily fouled up any shore cable inextricably. More than that, vessels equipped with a submarine bell could announce their own arrival off Fire island, for example, irrespective of fog or darkness, were an electrical receiver buoyed 3, 5 or 8 miles, say, off the nearest point of land approached by the incoming Atlantic liner.

Again, the electrical receiver can be used for detecting the approach of a submarine torpedo boat, the noise of which can be plainly heard at a distance of several miles, the sound being intensified by the fact that the submerged boat must transmit all its vibrations to the water, which incloses it on all sides. The United States navy department has offered facilities for making this test in the near future at Annapolis. Even small steam tugs on the surface of the water can be heard at a distance of 2 miles, the click of their machinery being distinctly audible. In the latter case only a fraction of the sound produced by the tug enters the water, most of it being transmitted by the air; but submarine boats must give all their vibratory noises to the water. As the receiver will tell the direction whence the sound proceeds the warship thus attacked may choose between running away or waiting until the torpedo boat comes within range, and then fighting her with her own weapons under water.

Thus the dawn of the new century finds man endowed with a new sense, as it were, particularly "those who go down to the sea in ships."

President McKinley has decided to reappoint Rear Admiral Charles O'Neil as chief of the bureau of ordnance. Admiral O'Neil's present term will expire in June.

Anywhere and return for $1.00—The Nickel Plate road announces to the public that on Sunday, May 5, it will inaugurate its usual summer Sunday excursions for parties of five or more traveling together on one ticket between any two stations on its line within a distance of 100 miles; the cost for which for each individual will be but $1.00. Organize your parties of five or more and enjoy a Sunday outing on the Nickel Plate road. Write, wire, 'phone or call on nearest agent, or address E. A. Akers, C. P. & T. A., Cleveland, O. 57, May 15.

DESCRIPTION OF THE KRONPRINZ WILHELM.

The Kronprinz Wilhelm, built for the North German Lloyd Steamship Co., was launched at the Vulcan works at Stettin recently. In general appearance she resembles the Deutschland of the Hamburg-American line and the Kaiser Wilhelm der Grosse of the North German Lloyd. Following are comparative particulars of these ships:

	Kronprinz Wilhelm.	Deutschland.	Kaiser Wilhelm der Grosse.
Length over all.....	663 ft. 4 in.	684 ft.	648 ft. 7½ in.
Breadth.....	66 ft.	67 ft.	66 ft.
Depth (moulded).....	43 ft.	44 ft.	43 ft.
Gross tonnage.....	14,800	16,502	14,349
Draught (normal).....	28 ft. 6 in.	29 ft.	28 ft.
Displacement.....	21,280	23,620	20,880

It will be seen from the table that the new ship is slightly larger than the Kaiser Wilhelm der Grosse, but 20 ft. shorter than the Deutschland. The vessel is built of German steel to the highest class at Germanischer Lloyd, as a four-decker with considerable extra stiffening. She has several flying decks. The poop is 35 metres (115 ft.) long, the bridge house is 114 metres (374 ft.), and the forecastle is 35 metres (115 ft.). Above the poop and bridge houses again there is a promenade deck 155 metres (508 ft.) long; and above this a sun deck of equal length. The double bottom system of construction has been adopted, there being twenty-four compartments between bottoms, while the interior of the ship is divided by fifteen transverse bulkheads reaching to the upper deck and thus far above the load water line, with a longitudinal bulkhead between the engines. All the bulkheads have been made sufficiently strong to stand the pressing due to any one of them being filled while the adjoining compartment is entirely empty. Another element in the safety of the ship is provided by pumps able to deal with 3,600 tons of water per hour, there being four centrifugal pumps, two bilge pumps, and six of the duplex type. As to the passenger accommodation, there are 214 cabins fitted for over 600 first-class passengers, 102 cabins for 350 second-class passengers, while on the lower decks comfortable quarters are provided for over 700 third-class passengers. The crew will number about 525. In addition to the ordinary state rooms there are eight luxurious cabins and four suites of rooms fitted for special passengers. These suites include a living room, bed room and a bath room.

The dining room, which occupies the central part of the ship, will be decorated with that artistic ornamentation characteristic of German ships, and will have accommodation for 414 passengers dining; the reading room, drawing room and smoking room are fitted on the bridge deck and their chief characteristic is the great height of ceiling. The second-class passengers have a dining room, smoking room and a drawing room located in the after part of the ship. To enable the doors in the water tight bulkheads to be kept closed at sea, a separate exit has been provided in each of those spaces below the upper deck, and at the same time there is a chart on the navigating bridge to show exactly the water tight compartment doors which the necessities of navigation may require to be left open. It is scarcely necessary to add that the compartments of the ship are specially heated and ventilated, and that electric light has been supplied on a generous scale. There are four dynamos, three in the after part of the engine room, between the two lines of shafting, and one on the main deck, so placed that it will be available even in the event of the engine room being flooded. The dynamos deliver a current of 100 volts and 825 amperes. Practically the whole of the accommodation of the ship is taken up with the passenger arrangements.

The main propelling engines of the ship are of the quadruple expansion type, working four cranks balanced on the Schlick system, the total indicated horse power anticipated in the design being 30,000 with the boilers working at 15 atmospheres (225 lbs.). There are twelve double ended and four single-ended boilers, as in the Deutschland, equally divided in four groups, so that in each compartment there are three double and one single-ended boiler, with a funnel for each battery, 34½ metres high (113 ft.) from the keel. The total heating surface is 8,700 square metres (93,649 sq. ft.), and the grate area totals 251 square metres (2,691 sq. ft.). The crank shaft is of nickel steel, while Tigel steel has been adopted for the propeller shaft. The two propellers are four-bladed. The contract speed, it is said, is 22 knots, and looking to the success of former ships built at the Vulcan works, there is every probability of this speed not only being realized, but excelled.

NO CHANGE IN CANADA'S NAVIGATION RULES.

Capt. George P. McKay, chairman of the committee on aids to navigation of the Lake Carriers' Association, has received the following letter from W. J. White, K. C., of Montreal:

"I regret to inform you that I have this morning received a letter from the deputy minister of marine and fisheries, in which he says that the question of a change in the rules of the road on the great lakes will not be considered at present. As you know, I have been at the department several times since you were there and on the 12th inst. I wrote the minister asking whether there was any prospect of the question being taken up this session and now have the above reply. The session will probably close about May 4, and under the circumstances I very much doubt that anything can be done this year."

This is the subject, it will be remembered, that Capt. Thomas Donnelly of Kingston, Ont., brought to the attention of the Lake Carriers' Association at its last annual meeting at Detroit and urged that action be taken to bring about uniformity in the rules governing navigation in American and Canadian waters on the great lakes. The international rules are observed in Canadian waters while the White law is followed in American waters. There are important differences in these rules which should be equalized. It was hoped to secure some action on the part of the Canadian parliament which would lead to the adoption by that government of the White law for the great lakes.

It is understood now that the battleship Maine will be launched at Cramps on Memorial day.

VIBRATION IN A TWIN-SCREW STEAMER.

An interesting paper was read before the Institution of Naval Architects in London recently upon the subject "On Some Experiments Made on Board the Atlantic Liner Deutschland During Her Trial Trip in June, 1900." The author of the paper was Herr Otto Schlick. An abstract of it was given by Engineering, London, as follows:

The paper was an elaborate and careful examination of the causes, other than those due to the engines, which produce vibration in a twin-screw steamer, it being proved in the first place, by running the engines without propellers, that no vibration of the hull takes place when balancing on the Schlick method is adopted. Only vibrations the period of which coincides with a revolution of the engine are dealt with. To measure these vibrations and to assign their correct positions with relation to the position of the cranks, an apparatus, spoken of as the pallograph, was fitted on the steamer Deutschland at the extreme after end. At this point, where the strongest vibrations are felt, the vertical movement was only 3-16 in., which, it is claimed, is exceedingly small in a vessel 662 ft. long and of 37,000 H.P. An electric device, by which a powerful spark is caused to punch a hole in the travelling band of paper on which the pencil records the vibrations, marks the moment in each revolution when the forward crank of each engine reaches its vertical position, and from the diagrams obtained the relationship of the vibration with regard to the position of the pistons can be readily determined. It was found that a maximum of the vertical vibrations always occurs when the port engine is about 90° to 100° ahead of the starboard engine; and a minimum when the difference in the position of the cranks is a further 180°, or when the port engine leads by 270° to 280°, which is the same as if the port engine is 80° to 90° behind the starboard engine, and from this the conclusion is reached that the cause of the vibrations cannot be due to deficient balancing, nor to the want of uniformity in the turning movement, as has often been supposed. The cause cannot lie in the engines at all, for if that were the case this cause would always occur in the one engine exactly when the other is in its symmetrical crank position. Therefore, when the maximum is attained both the cranks would have to pass the upper dead center simultaneously; on the diagram the marks of the starboard and port engines would have to correspond to an angle of 0°, and would have to be in a perpendicular line at right angles to the edge of the paper band, or, in other words, the red and green lines would have to fall together. The theory of the influence of the turning moment is, therefore, quite out of question.

The object of further investigations on the trials was to find the relationship between the vibratory movements—or the curves drawn by the pallograph—and the impulse causing the vibrations; or, in other words, to ascertain in which phase of the vibratory movement the ship's hull is to be found when the vibratory impulse has reached its maximum. These investigations lead to the conclusion that a certain blade on each propeller finds a somewhat greater resistance when turning in the water, and that the pair produces the greatest reaction in an upward direction when rising at about an angle of 30° from the center outwards. This difference in the resistance of the blades is the only cause which produces vibrations in a vertical plane. The propellers are, it should be remembered, four-bladed. After discussing the small horizontal vibrations which are due to torsion, and are also attributable to the propellers, the paper ends with the following remarks:

"If we sum up the results of the foregoing researches we have to record the following the critical number of revolutions for the vertical and horizontal vibrations have been pretty accurately ascertained. It has been proved that the slight vertical vibrations are neither caused by mistakes in the balancing of the masses nor by the vibrations in the turning moment or speed of revolution. It has been ascertained that the vertical vibrations are caused by a somewhat greater resistance in one blade on each propeller, and it has been shown which these blades are. The cause of the maxima and minima vertical vibrations have been found. It has been proved that each propeller blade finds its greatest resistance in revolving, when rising outwards at an angle of about 30° to the horizontal position. It has further been ascertained that the horizontal vibrations are also caused by the propeller blades, and that the number of the maxima and minima which occur during the time that one engine makes exactly one revolution more than the other depends upon the number of blades. The vibrations in the turning moments of the engines have no influence on the horizontal vibrations. Finally, the conclusions we have been enabled to draw from the appearances of the vertical vibrations, namely, that one blade on each propeller meets with a greater resistance when turning than the others, are also confirmed by the curves of the horizontal vibrations. These results agree on the whole with those which have been made by me on other vessels. The greater resistance of the one blade, of which we have repeatedly spoken, is probably in most cases to be attributed to the greater pitch of the same. The least deviation in the pitch, which cannot be proved by ordinary instruments, appears to be sufficient to cause perceptible vertical vibrations. The greatest care must therefore be taken in the manufacture of propellers, not only for the sake of preventing vibrations, but also for saving power, and in order to prevent blades from breaking."

BRASS LINERS ON PROPELLER SHAFTS.

Mr. H. F. Porter of the Bethlehem Steel Co., South Bethlehem, Pa., is seeking opinions regarding the best method of securing brass liners to propeller shafts. The following letter is addressed to the Review, but Mr. Porter would, of course, be pleased to hear from anyone who is interested enough to write him on the subject:

"We are, as you may be aware, making a great many forgings of propeller shafts. Sometimes these shafts are required to be finished complete with brass liners shrunk on at the bearings. Almost invariably the finished drawings show no method of securing these liners to the shafts. When the drawings show them secured, however, the usual method is by screwing a brass or bronze plug through the liner into the shaft. This method of securing the liner is, in our opinion, apt to weaken the shaft. We write therefore to ask if you would recommend the above practice as the best possible for the purpose, and if not, what other method you would suggest in its place? We are desirous of establishing some uniform and standard method of securing brass liners to shafts of this type and naturally wish to adopt the most approved method."

CONSTRUCTION OF TORPEDO BOATS AND DESTROYERS.

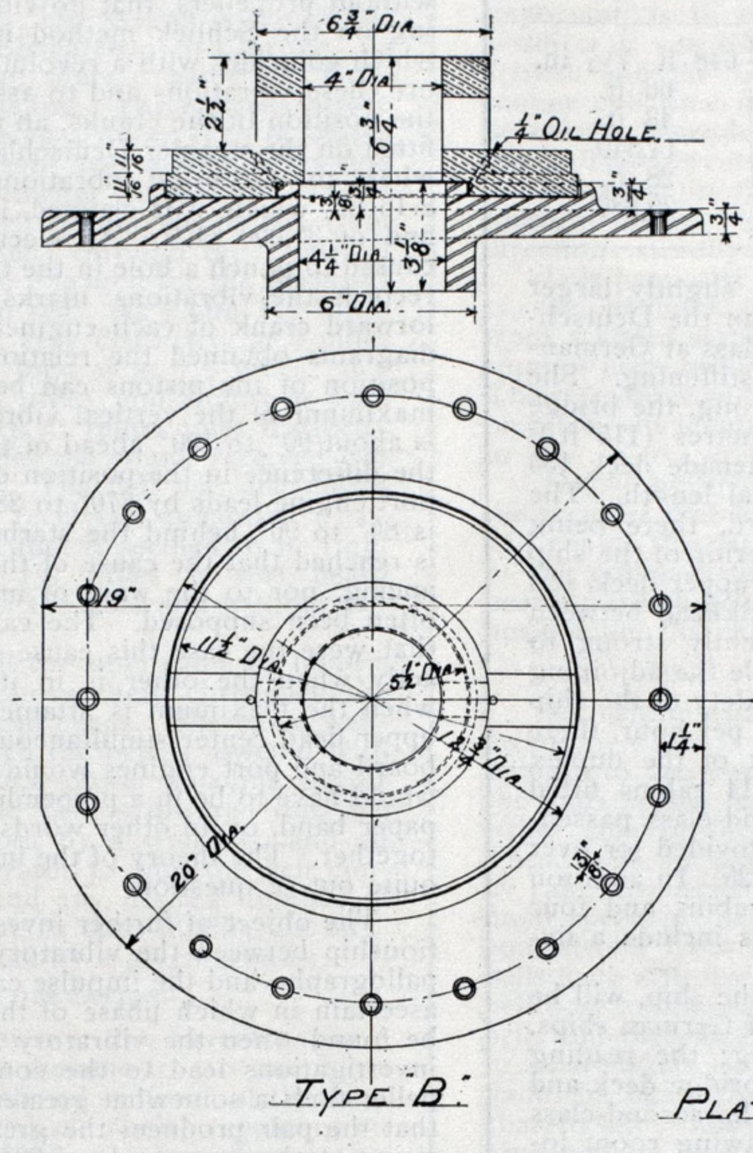
BY GEORGE HERBERT WILSON.

RUDDER CARRIERS AND DECK BEARINGS.

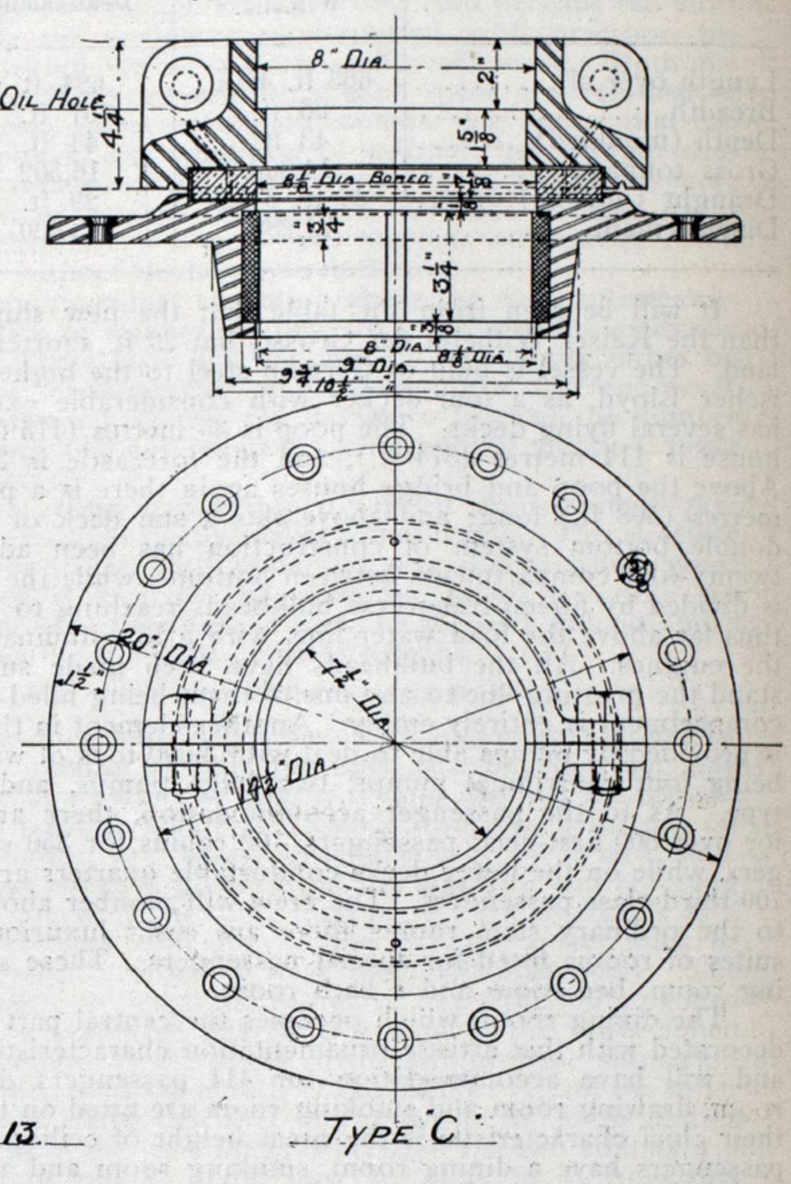
In dealing with the above fittings a thorough investigation into the requirements is necessary to the proper designing of the same. I have outlined the construction followed in three cases on boats built and building. The first of these, type C, plate 13, shows the rudder carrier used in connection with the rudder type A, plate 8, which is the overhung type of rudder. To gain a proper support and absolute rigidity, as is necessary to the working of these parts, a very strong connection to the hull is needed. With this end in view the horizontal and vertical plans were made very stiff and a sufficient number of rivets of the proper size was provided. Ample strength was thus given to resist the strains due to the weight of the rudder and those occasioned by racking. The stationary part of this group was made of cast steel, shaped to conform to the hull with a recess on its top face to receive the bearing ring and carrier. A composition bushing gave a good bearing surface for the rudder stock.

The rudder carrier was made up of a forging of steel, finished on all of the working faces, bored to suit the stock and a square hole cut through it to receive a tapered key. An intermediate bearing ring was also fitted between the bearer and the carrier of composition, thus providing good working surfaces —this ring being readily renewed. As all the parts of this arrangement are located at the upper deck of the boat in question, they are accessible for frequent oiling and cleaning.

The second of these sketches shows a bearing and carrier as used in connection with the rudder shown in plate 9, type B, and is represented by type A, plate 12. This construction, it will readily be seen, applies to the protected rudder, one which is hung underneath the keel of the boat. The questions of supporting the weight of the rudder and resisting the various strains are still to be considered, but the conditions of the hull structure are radically different. Excepting for the shape of the bearing and the shape and material of the carrier, the construction is similar to that described above. The bearer in this instance is spread out so as to cover considerable deck surface, thereby distributing the load in that vicinity. To allow for the sheer of the deck the palm of the bearing is tapered. A recess for the carrier, as in the other case, was made and a bushing of brass for the rudder stock was provided.



Type "B"



Type "C"

PLATE 13.

In the rudder carrier the departure from the previous method is somewhat greater, in that the material and shape have been changed. As regards the former the general knowledge of the two metals in question should decide the matter, but, when properly designed and when assurance is had of a good casting, the composition has a number of features in its favor. It is needless to say, however, that, considering the dependence to be placed on the parts in question, too much care cannot be given to their design, and from my own experience I would suggest the wrought steel as the better practice. Regarding the latter consideration, the change in shape, I have but one suggestion to make, and that is that the fillet between the vertical and horizontal parts should be of a larger radius, making a stiffer bearing surface all around.

Coming now to the last style of bearer and carrier: Type B, plate 12, shows the construction employed in connection with the rudder shown in this article on plate 11, which is also a rudder of the protected type. In this arrangement the bearer is somewhat similar to that just described, but the carrier is entirely different. In the bearer the same idea, that of spreading the weight over the deck plating, is carried out, but the length of the bearing surface on the rudder stock is longer and it has the additional advantage of being a white metal bearing, thereby increasing its efficiency. On the upper face the bearer is recessed to receive the bearer ring. Instead of making the bearer casting with a bevel to fit the deck it is made straight and a bevel liner of brass is fitted between it and the deck. This method is far more satisfactory, as a more nearly perfect fit is

PLATE 11.

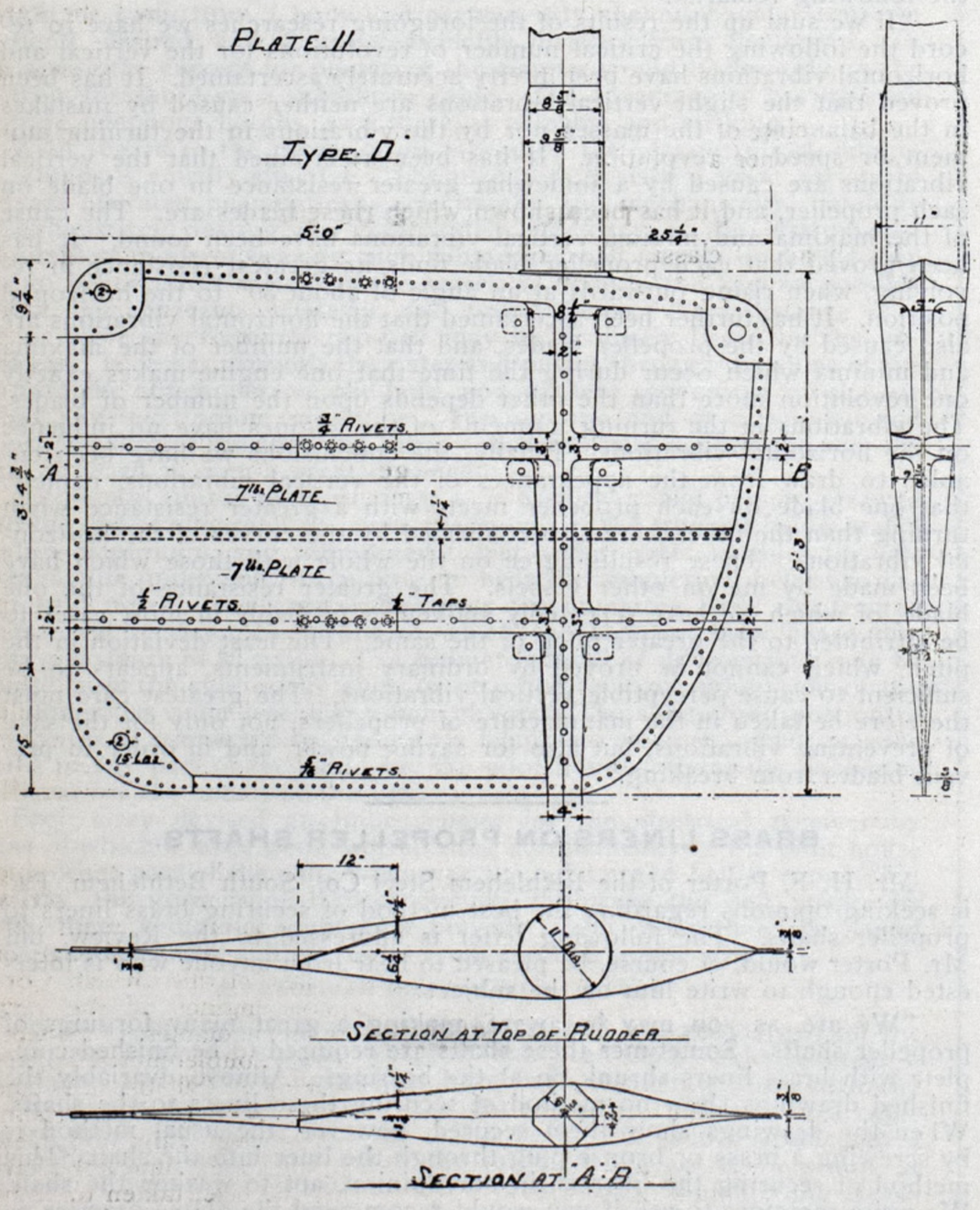
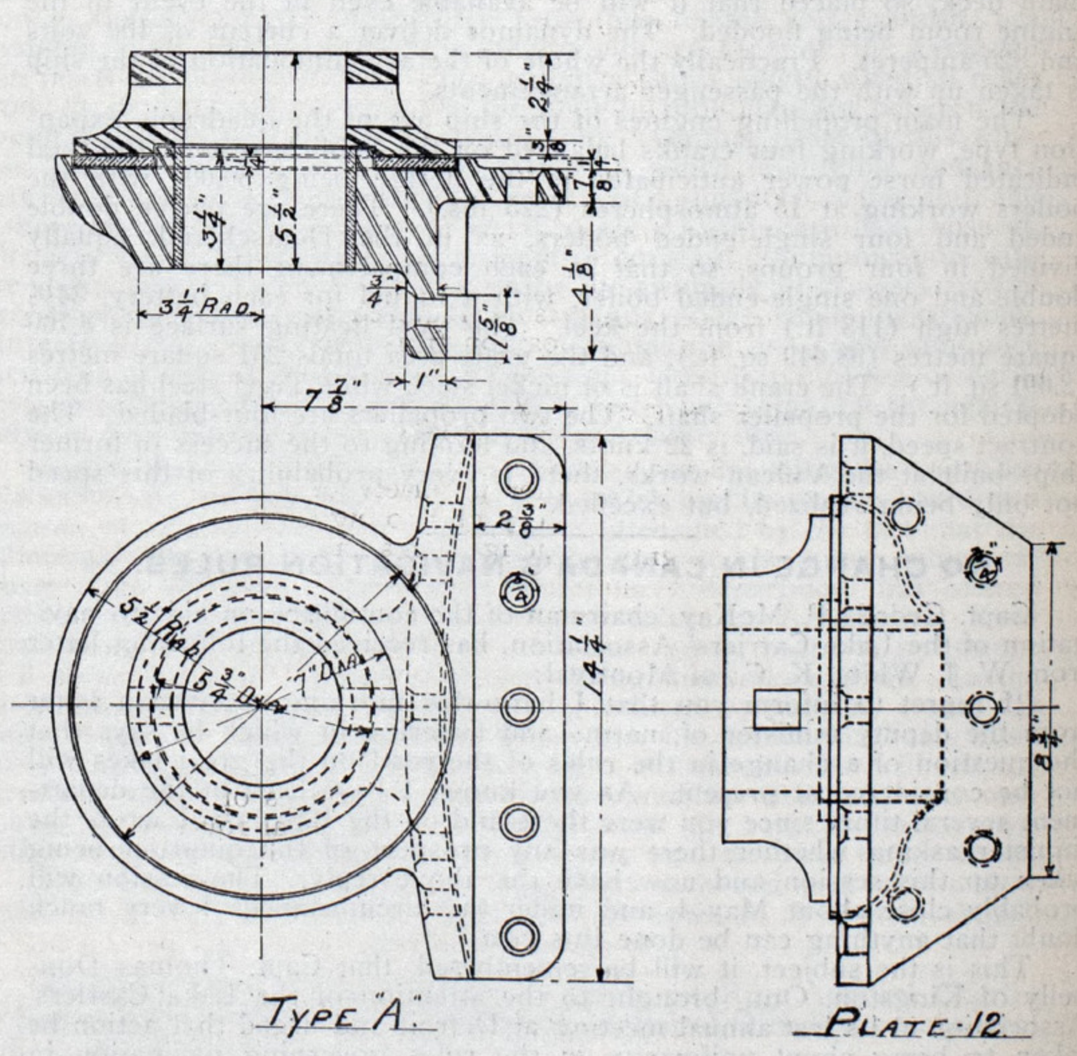


PLATE 12.



Type "A"

secured. In the carrier an entirely different idea is put forth and it is no doubt a far better construction than the key system previously mentioned. From the cost point of view it makes a less expensive job, and a more satisfactory fit can be secured than by a tapered keyway. As the one is nearly all machine work and the other hand fitted, the decrease in cost is readily seen and the ease in securing a good fit by the former method well known. In the matter of materials this construction has gone back to the cast-steel idea and the change is no doubt for the best. As in the first instance, a bearing ring of composition was fitted between the bearer and the carrier with oil grooves and holes for lubricating.

Reconsidering the various constructions and methods dealt with in this article some suggestions as to their efficiency is pertinent. For the overhung type of rudder the general idea as shown in plate 13, with a few modifications, seems to answer all the requirements. The modification I refer to in this instance is that instead of keying the carrier on to the stock it be made in two parts as a collar and clamped on, as shown in plate 12, type B. For the other type of rudder the protected type, I would suggest that the construction presented in plate 12, type B, be adopted as the most efficient method and the best all-around job.

In dealing with these deck bearings and carriers the construction of the details alone has been dealt with, but it must not be forgotten that the structural arrangements in the vicinity of these fittings has mostly to do with their proper working and efficiency. In the case of the overhung type the hull construction was in the shape of a belt frame at the stern, in the center line of the vessel, well bracketed to the deck and to the keelson and shell. Doubling plates and reinforcing angles were used where necessary. In connection with the protected rudder the construction was somewhat different. Doubling plates on the deck and the flat keel were put in and fore-and-aft girders worked on each side of the deck bearing. A box girder arrangement was worked in to take the lower bearing stanchions carried from this bearing up to the deck girders and well riveted, thus tying the two parts together and forming a rigid support for all the parts. The practice of fitting a sheet brass or copper hood over the rudder carrier and deck bearing to protect the working parts from dust, grit and the weather, is a very good one and is generally followed. It is made to unship when the spare tiller is used.

In the article following this the lower bearings or the main bearing of the rudder will receive some attention.

ITEMS OF GENERAL INTEREST.

H. C. Frick, formerly of the Carnegie Co., and Henry C. Morse of the New York Ship Building Co., Camden, N. J., have acquired 600 acres of land at Billingsport, N. J., on the Delaware river, about ten miles below Philadelphia and Camden. A large steel forging plant will be erected on this site, the product of which will be taken largely by ship building interests. John A. Potter, formerly superintendent of the Homestead Steel Works of the Carnegie Steel Co., is said to be preparing the plans. The plant is to cost about $2,000,000. Mr. Frick is interested with Mr. Morse in the large ship building works at Camden.

Examinations will be held at the navy yards at New York and Philadelphia May 1 for the position of carpenter, in which there are ten vacancies. All applicants must apply to the secretary of the navy, Washington, D. C., and to be eligible must be between the ages of twenty-one and thirty years. The pay of an acting carpenter is: First three years, at sea, $1,200, on shore, $900; second three years, at sea, $1,300, on shore, $1,000; third three years, at sea, $1,400, on shore, $1,300; fourth three years, at sea, $1,600, on shore, $1,300; after twelve years, at sea, $1,800, on shore, $1,600. They also receive 30 cents per day in lieu of ration. The pay of chief carpenter (after ten years' service), is the same on shore as at sea, $1,400 plus 20 per cent. ($280) and commutation for quarters ($288); total, $1,968. Medical attendance and medicines free, but like every other person in the navy, 20 cents per month is deducted for the hospital fund. Upon reaching sixty-two years of age carpenters are retired on three-fourths pay.

It is now generally admitted that the project for an expenditure of $26,000,000 on canal improvement in New York state, providing only for enlargement on a canalboat basis, is dead, and that agitation for the 1,000-ton barge canal, to cost $62,000,000, will begin anew. It is thought, however, that the enormous bond issue required for the larger project will meet with a great deal of opposition from the people of the state. "One reason for opposition to it," says a New York dispatch, "will be the feeling that if such a canal is built it should be by the general government, and that a ship-canal between the lakes and tidewater is of more direct importance to American interests than a ship-canal across the isthmus, to say nothing of the greater propriety of building a canal in American territory than in the territory of a foreign country which does not intend ceding its sovereignty, although it may allow the United States government to build a canal and police it—subject always to the sovereign rights of the domestic government."

E. E. Sawyer of London, who is one of the principal promoters of the project for a canal to connect Georgian bay with Montreal, has been working very earnestly with members of the Canadian parliament during the past few weeks. The Georgian bay and Ottawa canal scheme is, of course, one of special merit, but the cost of such a waterway would be enormous. In an address before one of the committees of parliament at Ottawa, a few days ago, Mr. Sawyer described the canal route, which includes French river, Lake Nipissing and the Ottawa river, and declared that by it the distance from Chicago to Montreal was only five miles longer than from Chicago to Buffalo. He estimated that by the canal grain could be taken from Chicago to Montreal for 3 cents per bushel, while via Buffalo, the lowest cost at which grain could be placed in New York would be 4½ cents. The canal route from Chicago to Montreal, a seaport, would be sixteen hours longer in time than to Buffalo. In this connection he read a letter from the Armours of Chicago saying that if such a rate could be offered the canal would get as much business as it could handle.

Settlers' rates via the Nickel Plate road—Beginning with Tuesday, Feb. 12, low rate settlers' tickets will be on sale every Tuesday to and including April 30, to Oregon, Montana, Washington and all points in the Northwest. Write, wire, 'phone or call on the nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O.
10 April 30,

SHIP BUILDING NOTES.

The name of the new ship for the Maine Steamship Co., building at Roach's ship yard, Chester, Pa., has been changed from John Englis to North Star. Mr. Englis, who was formerly president and general manager of the line, has sold his controlling interest in the company to other parties, who have changed the name. The new ship, which will be 315 ft. long, with 200 state rooms, will be launched early in May and will be ready to go on the route between New York and Portland in July. Two splendid steel propeller wheels, cast in one piece and weighing about 17,000 lbs. apiece, were cast at the Seaboard Steel Casting Co.'s works at Chester, Pa., last week. One is for the new steamer North Star, building at Roach's, and the other is for a repair job on the old Dominion steamer Jefferson, at W. & A. Fletcher's, Hoboken, N. J. The wheels are each about 16 ft. in diameter and are as fine looking samples of steel castings as have ever been made.

Following are the dimensions of a new five-masted wooden schooner, the J. C. Strawbridge, launched from H. M. Bean's ship yard at Camden, Me., on Thursday last: Length of keel, 170 ft.; beam, 37 ft.; depth of hold, 17 ft. The four masts are of Oregon pine, 88 ft. long, the bowsprit of hard pine, 38 ft. long, jibboom of spruce 35 ft. long, spanker boom of Oregon pine 63 ft. long and the topmasts 55 ft. long. She has a Hyde engine windlass and four anchors weighing 3,200, 3,000, 500 and 250 lbs. Her 1¾ chains, 180 fathoms, were made in Pennsylvania. Officers' quarters in the after cabin are finished in cypress, heated by steam and include bath room and many other modern conveniences. The Strawbridge is intended for the coasting trade and will be commanded by Capt. J. M. Coombs of Everett, Mass. A five-masted schooner building at the same yard for Capt. J. G. Crowley will be launched some time in August.

The marine department of the New York Central & Hudson River Railway has awarded to T. S. Marvel & Co. a contract to build two steel tug boats, 81 ft. long, 20 ft. beam and 10 ft. 6 in. deep. They are intended for use as switching tugs at the New York Central and West Shore terminal stations.

It is understood that at the close of the present season the American liner New York will be sent to the works of the Cramps at Philadelphia to be fitted with new engines. The most conspicuous external change will be the substitution of two new funnels for the three which the steamer at present carries.

The Polson Iron Works has contracted with the Dominion government for the construction of an hydraulic dredge for the St. Lawrence river of the following dimensions: 160 ft. long, 42 ft. beam and 12 ft. 6 in. deep. She is to be built of steel.

The schooner Charles W. Lynde was launched a few days ago from Dewitt Conklin's yards, Patchogue, L. I. She is owned by George Jones and will be used in the carrying trade between New York and Long Island ports.

A four-masted schooner, the Adelaide Barber, was launched from William Currier & Co.'s yards at Newburyport, Mass., recently. She is of 180 ft. keel, 40 ft. 6 in. beam and 18 ft. depth.

H. M. Bean of Camden, Me., launched last week the four-masted schooner J. C. Strawbridge, build for Capt. J. G. Crowley of Taunton, Massachusetts.

The Holmes Ship Building Co., West Mystic, Conn., laid the keel for a five-masted wooden schooner for the Sutton fleet last week.

The next launching at the works of the Newport News Co., Newport News, Va., will be that of the Morgan liner El Dia, on May 18.

William Rogers, Bath, Me., will stretch the keel for a 1,300-ton wooden schooner about May 1, his 103rd vessel.

SHEATHING IS FREE OF DUTY.

The board of classification of the United States general appraisers of New York rendered a decision this week of interest to ship owners.

The specific case passed on by the board was the protest of Alexander & Baldwin of Honolulu, Hawaiian islands, against the action of the collector at that port in assessing duty on metal sheathing. The facts in the case are as follows: On April 20, 1896, the owner of the American bark Edward May withdrew from bonded warehouse at New York certain yellow sheathing metal, which was placed upon the hull of the vessel. The merchandise was accorded the privileges of section 7 of the tariff act of 1894. This section provides that all materials of foreign production which may be necessary for the construction and equipment of vessels built in the United States for foreign account and ownership, or for the purpose of being employed in the foreign trade, may be imported in bond and no duties paid thereon. The above provision has been retained in the present Dingley tariff law. The vessel was used in the foreign trade more than four years, when in June, 1900, being in Honolulu, she exchanged her foreign register for coastwise enrollment. During all this time the sheathing remained upon the hull. The collector at Honolulu exacted the full duties on the ship's sheathing, which action the owners regarded as unauthorized. The board sustained the protest that the sheathing was free of duty, and the decision of the collector was reversed, with an order to reliquidate the entries.

Messrs. D. & W. Henderson & Co., Ltd., launched from their ship building yard at Meadowside, Glasgow, last week a large steel screw steamer for the Anchor line, of the following dimensions: Length, 390 ft.; breadth, 47 ft.; depth, 30 ft. 6 in. molded, with a gross tonnage of about 4,500. The vessel is built to the highest class of the British Corporation, and will be fitted with triple expansion engines of the very latest type, with cylinders 31 in., 50½ in. and 84 in. in diameter, respectively, with a stroke of 4 ft. 6 in. There will be two double-ended boilers and two single-ended boilers, working to a pressure of 180 lbs. As she left the ways she was named the Calabria by Mrs. Richard Henderson. The Calabria is intended for passenger service between Italy and New York, and her passenger accommodation will be of a very superior character. In the building of the Calabria special care has been taken to comply with all the complicated requirements of the Italian and American laws for passenger vessels. There are still three other vessels building at Meadowside for the Anchor line, one of which, the Perugia, a sister ship to the Calabria, and also intended for the Mediterranean service, will be launched in a few weeks.

TRADE NOTES.

Forgings for the new steamer which is to be built at Roach's ship yard, Chester, Pa., for the Savannah line, will be made by the Cleveland City Forge & Iron Co.

Fred H. Pell, 1206 Bowling Green building, New York, has just taken the agency in New York and New England states for the Baldt anchor, manufactured by the Baldt Anchor Co. of Chester, Pa.

Manning, Maxwell & Moore, New York, have been awarded the contract for the entire machinery equipment to be installed in the new shop to be erected at Seattle by Moran Bros. Co. The order amounts to more than $50,000.

Pumps for the two steamers of 7,000 tons capacity building by the American Ship Building Co. in Cleveland for Charles E. & W. F. Peck of New York, and which are to engage in transatlantic service, will be furnished by the Geo. F. Blake Mnfg. Co. of New York.

The Interlocking Steel Sheeting Co. Chicago, has been formed to put into commercial use certain patents secured by Mr. George W. Jackson, an engineer, for the use of steel in cofferdam work and sheathing in marine foundation construction. Hempstead Washburne, former mayor of Chicago, is the president of the company.

The American Wood Fireproofing Co., Ltd., No. 11 Broadway, New York, with works at Newark, N. J., reports that it has received contracts for supplying the United States cruiser Baltimore with fireproofed wood and has also received orders from the Fore River Ship & Engine Co., Quincy, Mass., and the Harlan & Hollingsworth Co., Wilmington, Del.

Jenkins Bros. of New York, in the preface to their book on valves, say: "If you will put a Jenkins Bros. valve on the worst place you can find, where you cannot keep other valves tight, and if it is not perfectly tight, or does not hold steam, oils, acids, water or other fluids longer than any other valve you may return it and your money will be refunded."

Messrs. Cole & Kuhls of Brooklyn, N. Y., have moved all machinery to their new place of business, corner of Third avenue and Twenty-third street, which they have purchased. This company's business in the sale of elastic seam composition increased to such an extent that they were forced to look for larger quarters so as to be able to promptly fill the large orders which they are receiving.

The American Bridge Co. will make quite an elaborate building exhibit at the Pan-American exposition, furnishing two buildings, each about 60 ft. in width and about 150 ft. in length. One of the buildings will be of extremely plain construction, being designed for use as a manufacturing plant. The second, however, will be of ornamental design, such as would naturally be used for freight depots, street car barns and that class of structures. The American Bridge Co. will also make an extensive exhibit of parts of large bridges. This company will furnish to J. G. White & Co., Inc., New York, the structural steel work for power plant for the Kalgoorlie Electric Power Co., Kalgoorlie, Australia. The plant consists of an engine house 43 by 159 ft., with a lean-to 17 by 40 ft., and a boiler house 41 by 132 ft.

The Seaboard Steel Casting Co. of Chester, Pa., is making a great many of the new "admiral" stockless anchors for the coast ship builders. The "admiral" anchor is made of the best open hearth steel and has many advantages which ship owners appreciate. Among recent purchasers of this style of anchor, ranging from 500 to 10,000 lbs. in weight, have been the Cramps, Harlan & Hollingsworth, Roach's, New York Ship Building Co., Neafie & Levy and Dialogue's ship yards, Hughes Bros. & Bangs, vessel owners, and others. An Olsen testing machine, capable of a dead weight pull of 400,000 lbs. and approved by Lloyds agency and the various American underwriters, has been added to the equipment at the Seaboard plant for the purpose of testing these anchors.

Mr. E. H. Hovey, vice president of the Steam Boiler Equipment Co. of New York, secured while in Cleveland recently an order from the Great Lakes Towing Co. to apply the Equipment company's apparatus to one of their harbor tugs. Success with the trial means the adoption of the system on all the towing company's vessels. This system of fuel-economizing, smokeless furnaces was fully described in a recent issue of the Review. It has been adopted by owners of some of the finest steam yachts of New York, as well as the management of the White Star line, Mallory & Co., Neafie & Levy, the Delaware River Navigation Co. of Philadelphia, and others. Mr. Hovey organized at Indianapolis the Steam Boiler Equipment Co. of Indiana, with Mr. John T. Brush as manager. Mr. Brush is the noted base ball magnate. Other local capitalists are also interested. In a week after this company was organized its orders for equipment embraced the entire street railway system of Indianapolis, and also the Columbian Club, the finest club building in Indiana.

LARGE ORDER FOR PUMPS.

The Geo. F. Blake Mnfg. Co. have just closed a contract for what is said to be the largest order for ships' pumps ever placed in America. The pumps have been ordered by the Eastern Ship Building Co., New London, Conn., and will be installed in the two steamships now building by that company for the Great Northern Steamship Co. The order consists of thirty large steam pumps, all compound and of most economical proportions. Each vessel will be fitted with two simplex, vertical, cross-compound featherweight air pumps of the suction, valveless type, with 20-in. air cylinders. The feed pumps are especially designed to pump against a pressure of 400 lbs. The auxiliary feed pumps, ash ejector pumps, general donkey, ballast and fire pumps, are all duplex pumps, and almost all are vertical. The pumping capacity is stated at 7,000 tons per hour.

The Wheeler Condenser Co. of New York has contracted with the Eastern Ship Building Co. for four sets of auxiliary condensers and feed heaters to be fitted on the above mentioned ships. Each auxiliary condenser will have about 1,000 sq. ft. of cooling surface.

Gillender Building, Nassau and Wall Streets, New York City.

STRUCTURAL STEEL SUPPLIED BY THE AMERICAN BRIDGE COMPANY, POST AND MCCORD PLANT.

Bridges, Buildings, Roofs, Trusses.

Steel Frame Work for Mills, Factories, Race Stands, Public Markets, Power Houses, Car Sheds.

Branch offices throughout the country
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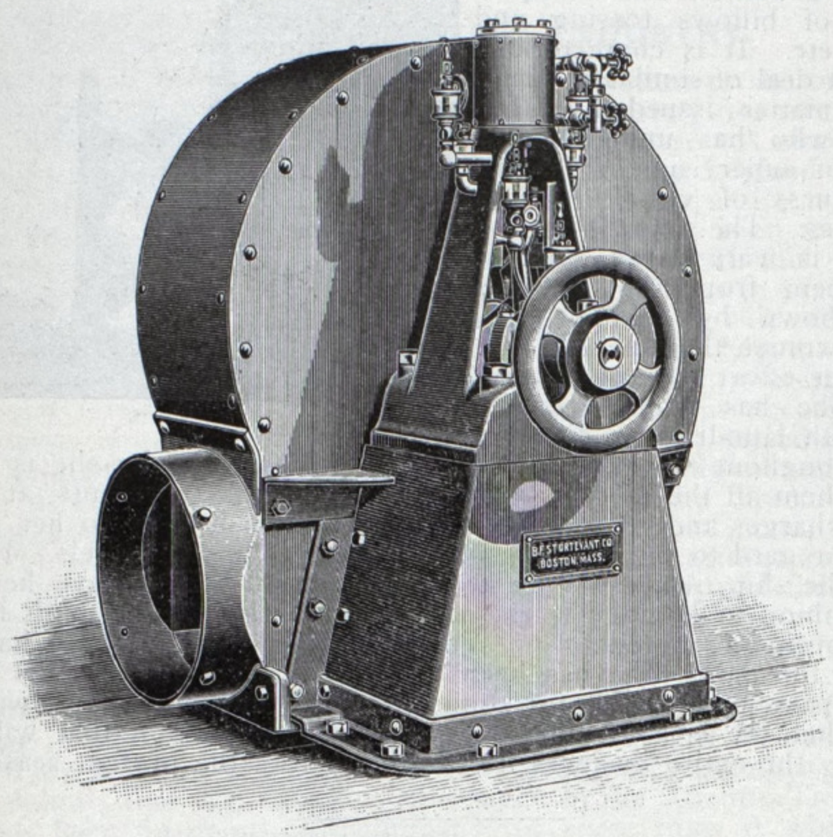
General Offices, 100 Broadway, N.Y.

LILLIBRIDGE, N.Y. 21-164.

MODERN STURTEVANT STEAM FAN.

The rapid increase in the use of small independent-driven fans which has marked the progress of the last few years has led to the design of both motor and engine driven fans to meet this requirement. Where electricity is not available as motive power the steam fan becomes a natural substitute. The B. F. Sturtevant Co. of Boston, Mass., has recently brought out a line of small sizes of steam fans of which the accompanying illustration gives a good idea. These fans range in total height from 30 in. to 50 in. and weigh from 350 to 950 lbs. These are



designed for creating pressure of at least one ounce per square inch when engine is operated under 80 lbs. of steam, and for this purpose the engines have to be constructed to run from 650 to 1,250 revolutions per minute, according to the size.

Such high speed naturally requires the utmost care in the design and construction of the engine. Of course certain difficulty arises from the small type of the engine itself, the minimum size of cylinder in this size being 2½ in. in diameter by 2 in. stroke. In all cases, however, these engines are equipped with piston valves, with marine type connecting rods, counter-balanced crank and complete continuous sight feed oiling arrangements. All moving parts are adjustable for wear and the cylinder is lagged to reduce condensation. A hand wheel is provided for starting the fan, which latter is of the well known Sturtevant construction, consisting of a steel plate housing with light and carefully balanced steel plate wheel within. This wheel is mounted upon the extended engine shaft and draws the air through the inlet from the farther side.

These fans find especial use in small mechanical draft plants where they may be operated independently of any other source of power and find particular opportunity for service on board steam yachts and similar small vessels.

TO BE SEEN NEAR THE EXPOSITION.

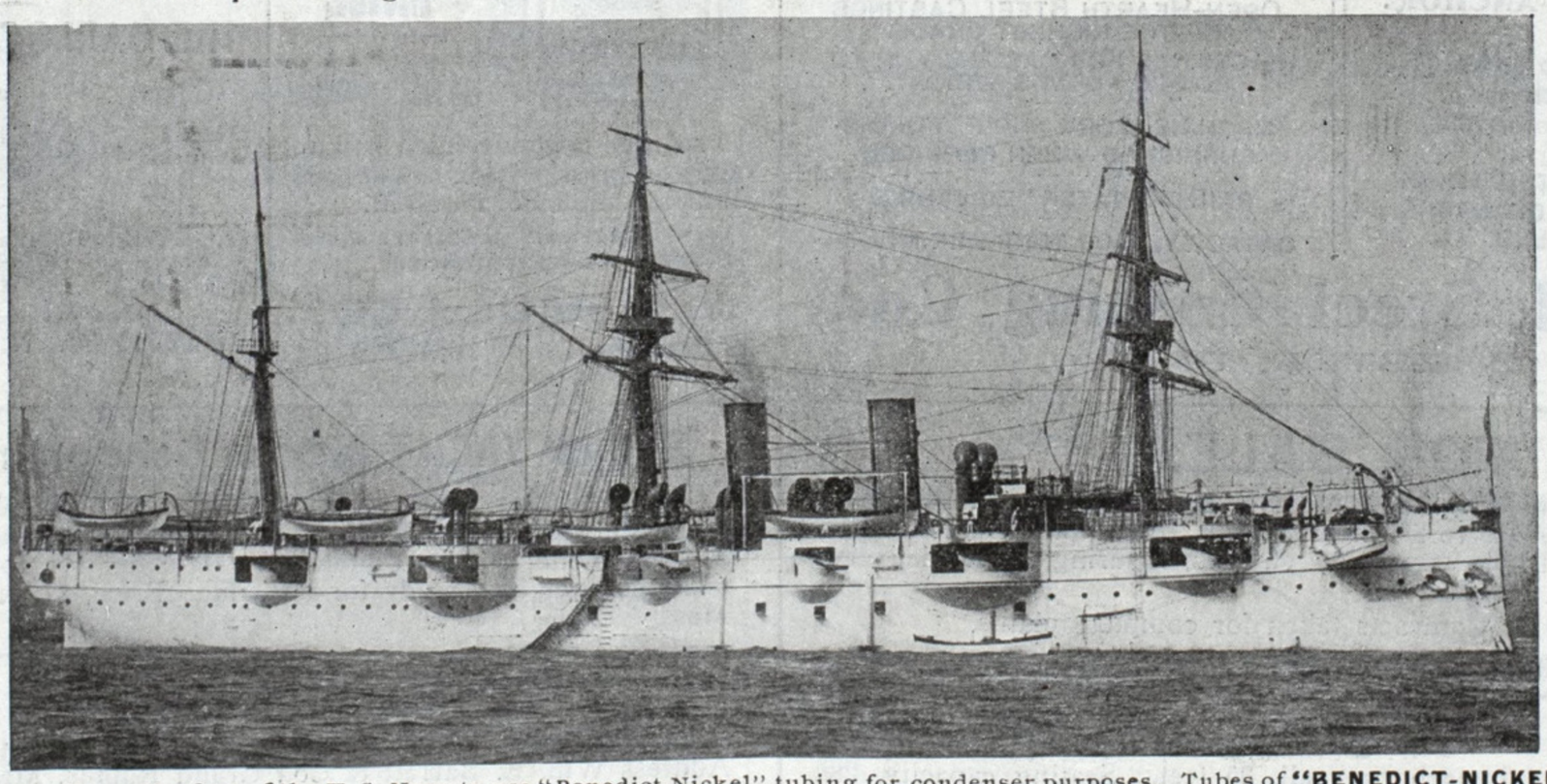
Though not strictly a feature of the Pan-American itself, there will be located a stone's throw from the exposition grounds a plant which will be well worth the inspection of the visitor interested in mechanical subjects. We refer to the large plant which is being constructed by the Buffalo Railway Co. for the purpose of furnishing power to aid in the operation of its street railway lines during the exposition period, when a great increase in its traffic is to be expected. One of the features of this plant will be the installation of a large mechanical induced draft fan to produce the draft and handle the gases of combustion from a boiler plant that will have a nominal capacity in the neighborhood of 2,500 H.P. This fan was built by the Buffalo Forge Co. It is 24 ft. in diameter, of the three-quarter housing, up-blast type, and is rigidly constructed of steel plate, braced and stiffened with angle irons. The fan is designed as an exhauster with an inlet 9 ft. in diameter and will be driven by belting to a Buffalo 13 by 12 horizontal, center-crank, class "A" engine. In order to keep the bearings cool, a constant circulation of water will be maintained around them. The short stack into which the fan will discharge will be of sheet steel.

This particular plant illustrates very nicely some of the inherent advantages of mechanical induced draft. For instance, there is no need of a tall heavy chimney, and again, since the material is all steel plate the plant can be constructed and installed in a minimum length of time. Once in place, this apparatus is in complete control over combustion and renders the performance of the boilers independent of those conditions of weather, wind, temperature and the like which influence plants served with chimneys. The intensity of the draft is in proportion to the fan wheel velocity, and hence can readily be altered to suit varying conditions.

One cent a mile to the Pan-American Exposition at Buffalo via the Nickel Plate road on May 15 and 29. Train leaves Bellevue, O., at 12:15 midnight, leaving Cleveland at 2:06 a. m., and arriving at Buffalo at 7:35 a. m. Tickets are good returning within three days on any one of our peerless express trains where scheduled to stop. For rates and time of train at intermediate stations see bill, call on nearest agent or address C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 49, May 29.

"BENEDICT-NICKEL"
Seamless Tubes for Condensers

contain no zinc nor any weakening metal. They resist all electrolysis and corrosion. The tubes are formed by a hot-rolling process which by a single operation transforms a solid cylindrical billet of the heated metal into a seamless tube, perfectly homogeneous and absolutely flawless. The tubes are then cold drawn to the sizes desired, which process gives them a perfectly smooth finish INSIDE and OUTSIDE.



The "NEWARK" was the first of the U. S. Navy to use "Benedict-Nickel" tubing for condenser purposes. Tubes of **"BENEDICT-NICKEL"** which were taken from the condenser of the American Line Steamer "St. Paul" after 28 months' service were in perfect condition.

A treatise on "Electrolysis of Condenser Tubes" mailed upon request.

We are also manufacturers, in a large way, of COPPER Sheets and Bolts; Seamless COPPER and BRASS Tubing for Condensers and other Marine Work, and can furnish TOBIN BRONZE, Rods and Sheets, in any quantities desired.

BENEDICT & BURNHAM MFG. CO.,

Mills and Main Offices, **WATERBURY, CONN.** Depots: NEW YORK, 253 Broadway. BOSTON, 172 High Street.

BUSINESS MATTERS.

A business card from the Champion Rivet Co. of Cleveland contains a neat half-tone picture of the Russian cruiser Variag, fastest war ship in the world, built by the Cramps of Philadelphia. Victor boiler rivets, made by the Champion company, were used on this vessel. Referring to the quality of Victor rivets the Champion company says: "As every car load of steel received by us is fully tested, both physically and analytically, we are prepared at any time to furnish to our customers full data. We guarantee every rivet we make to be perfect in every respect."

The preface to catalogue No. 14 of the Marine Iron Works, Chicago, is as follows: "We have no down-town office or agency. Our shops and yards are all together at the foot of C street, a few rods south of the corner of Clybourn and Southport avenues—about twenty-five minutes' ride north from the city hall on a Clybourn avenue cable car. We offer only our own product and are pleased to receive callers. Our exclusive specialty is the building of high-grade marine machinery and complete steam craft in small and medium sizes. Having the best of modern shop equipment and an experienced working force, we respectfully invite the attention of all interested to our product and the critical examination of those most highly trained to pass judgment—the marine engineer." The firm are builders of marine engines, marine boilers, marine machinery and complete steam craft.

Nearly all of the army transports are equipped with the hooks for detaching boats that are made by the Standard Automatic Releasing Hook Co. of No. 17 State street, New York, and from the manner in which these hooks are commended by officers of the transports it is certainly fortunate for the New York company that they were adopted in this very efficient branch of the government service. Loren C. Caddell is first officer of the transport Burnside, now engaged in laying cable in the Philippines. He says: "Sometimes we have all the boats and the two steam launches in the water twice in four hours. We have lowered the boats in very heavy seas, and I cannot speak too highly of the magnificent way in which the releasing hooks work. I do not know what we would do at times if we did not have them. It is the simplest, best and most reliable device I have ever been shipmates with, and I cannot find words strong enough to praise it."

NICLAUSSE BOILERS FOR WAR SHIPS AND MERCHANTMEN

Orders have just been placed for Niclausse boilers for the French armored cruiser Leon Gambetta of 27,500 H.P. and 12,000 tons displacement. This ship is the first one under construction by the French navy since the armored cruisers Conde and Loire were completed, in both of which ships Niclausse boilers were also installed.

Following the trials of H. M. S. Sea Gull, the English admiralty ordered Niclausse boilers for the armored cruiser Suffolk of 22,000 H.P., and for the gunboat Merlin of 1,400 H.P.

The Russian government has also just placed an order with Messrs. Niclausse for a boiler plant for the school ship Ocean, which is being constructed at the Howald Works at Kiel.

The above mentioned sales were made by foreign concerns. The Stirling Co. of Chicago, which controls the Niclausse boiler for the United States, are now completing the installation of boilers in the United States battleship Maine and the United States monitor Nevada, and are working on boilers for the two very large steamers now in course of construction by the Eastern Ship Building Co., New London, Conn., for the Great Northern Railway Co.

Heavy buying of steel rails noted of late is due in part to an expected advance to $28, which will probably be made effective May 1.

A WOMAN'S ORIGINAL SCHEME.

The accompanying attractive picture, taken from advertising matter sent out by Mrs. R. L. Dorner, laundry expert of 436 Sixty-fifth street, Chicago, is associated with a catchy story of a juvenile party that "went sailing one morn from table bay, along the carpet sea," with Dorothea as pilot, bold Jackey as boatswain and with pretentions of billows tossing and roaring, etc. It is characteristic of a great deal of similar pleasing reading matter issued by Mrs. Dorner, who has undertaken a scheme of supervising the laundry business of vessels of the great lakes. The volume of this business is very large, and it would seem from the business ability shown by this original Chicago woman that she will succeed in the effort she now has on hand. She has made arrangements with laundries in different cities throughout the lakes (one in each place), whereby she is to turn over to them all the business of vessels which she represents, at a fixed scale of charges and on condition that they shall live up to her requirements in regard to the service they are to give to the vessels. Her service to the ship owner will be to rectify abuses which have heretofore been common in laundry work, and in places secure, through the volume of business offered to one concern, lower charges than have prevailed in the past. She has been taking contracts from vessel men in different parts of the lakes for some time past, and is meeting with such success that she is confident of having an organization that will cover practically the entire business in this line before the present season is at an end.

The Marine Iron Works, station A, Chicago, have just issued a new 48-page catalogue descriptive of their product, which they will send free on receipt of request. A separate pamphlet issued by the same company, devoted especially to "River Navigation" (shallow water stern wheel boats), will also be included if asked for. 1

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON ORDER, OR STOCK ORDERS PROMPTLY FILLED.

A GUARANTEE OF QUALITY.

OPEN-HEARTH STEEL CASTINGS OF THE HIGHEST GRADE.

FACILITIES FOR CASTINGS UP TO 80,000 POUNDS WEIGHT.

MACHINE WORK AND PATTERNS FURNISHED WHEN REQUIRED.

RAIL OR WATER DELIVERIES.

CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,
CHESTER, PA.

BURNISHINE.

THE MOST MARVELOUS METAL POLISH IN THE WORLD.

In Liquid and Paste Form.

Will Polish Hot or Cold Metal, no matter which.

Produces a wonderfully brilliant lustre on brass, copper, nickel and all metals, no labor required.

Used on steamers all over the world.
Free samples on application.

J. C. PAUL & CO.
57 Dearborn St., CHICAGO, ILL.

Engineers

in every section of the world should interest themselves by

Getting in touch with us.

We know that we can be of service to you if you will write us your wants as regards PACKINGS for your valve rods, pistons, etc. We are the manufacturers of

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NONE GENUINE — TRADE Garlock MARK — WITHOUT IT.

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FOR SALE.

BALANCED COMPOUND MARINE ENGINES carried in stock for immediate delivery—20 to 200 horse power. Full line of patterns for larger sizes and quadruple expansion engines, insuring quick delivery. Highest economy and speed.

NO VIBRATION. Contracts taken for complete plants.

July 25. WELLS ENGINEERING CO., 136 Liberty St., NEW YORK, N. Y.

Five Electric Passenger Launches For Sale.

In fine condition. Length over all, 35 feet. Seating capacity, 28. Send for price list. Yacht brokers, please note. Milwaukee Electric Launch Co., 1504 Monadnock Block, Chicago. tf

SIDE-WHEEL TUG FOR SALE.

Length 66 ft., depth 5 ft. Boilers new. Machinery in good state of repair. For further particulars address The I. Stephenson Co., Wells, Delta County, Mich. April 25.

STEAM YACHT (Screw Schooner) FOR SALE.

Dimensions: Over all, 73 ft. 1 in.; water line 63 ft. 7 in.; beam, 12 ft. 3 in. Vertical steeple-compound condensing engines, 10 and 20 by 12 in. Seabury boiler. Accommodations in cabin for four persons. All furnishings complete, ready for cruising. Price, $7,500. Box 2275, Boston, Mass. May 9.

LUMBER SCHOONER FOR SALE.

A first-class lumber schooner of 275,000 ft. capacity cheap for cash. Address Wm. E. Barrett & Co., Grand Rapids, Mich. May 9.

FOR SALE OR CHARTER.

First-class British steamers, of Welland canal dimensions; about 3,250 gross tons capacity, carrying about 2,000 gross tons on 14 ft. (fresh water) draught. Speed 10 knots loaded; easy consumption. Large hatchways. For further particulars address "Charter," The Marine Review Pub. Co., Perry-Payne Bldg., Cleveland, Ohio. May 2.